FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1097. (No. 1. Vol. XXII.) JANUARY 3, 1930 [Weekly, Price 6d. Post free, 7d.

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telephone: Holborn 3211. Telegrams: Truditur, Westcent. London.

Annual Subscription Rates, Post Free.
United Kingdom .. 30*s.* 4*d.* Abroad .. .. 33*s.* 0*d.**
* *Foreign subscriptions must be remitted in British currency.* (*See last Editorial Page.*)

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930

Jan. 3 .... **Dinner Dance at Hanworth Club.**

Jan. 8 .... **Private Exhibition of M. Bleriot's Film "25 Years of Aviation," by Guild of Air Pilots, at Edibel Cinema.**

Jan. 22 .... **"The Strategical Mobility of Air Forces," Lecture, by Gp.-Capt. C. L. Courtney, before Royal United Service Inst.**

Feb. 5 .... **Schneider Trophy Banquet at Savoy Hotel.**

Mar. 5 .... **"Air Co-Operation with Mechanised Forces," Lecture, by Wing-Com. T. L. Leigh-Mallory, before Royal United Service Inst.**

June 28 .... **Royal Air Force Display, Hendon.**

Sept. 6–28 .... **Aero Exhibition, Stockholm, Sweden.**

Nov. .... **Paris Aero Show**

EDITORIAL COMMENT

FLIGHT offers the very heartiest welcome congratulations to Air Chief Marshal Sir John Maitland Salmond, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C., on his appointment as Chief of the Air Staff. This appointment was inevitable. Sir John Salmond has earned it by sheer hard work and outstanding administrative ability. He is one of the few officers in any of the services who started by displaying great personal gallantry; then proved himself an inspiring and gifted commander; and finally has developed into an organiser and initiator of quite exceptional parts.

The New C.A.S.

The air force is a new service. Almost everything about it is new. Its functions and duties are always on the increase. Among the innovations which it has undertaken in the eleven years since the Armistice, there are two which are unique in importance. These are the air control of Iraq and the Air Defences of Great Britain. Each of these was started on its way by Sir John Salmond. Each of these involved a totally new conception of armed power and in particular of air power. Each had to be evolved out of a service which was itself new. There was in each case a minimum of precedent and tradition to guide the man in charge. It was laid upon this man first to formulate the principles which should guide the movement, and secondly, to mould the units of a young service into conformity with those principles.

In Iraq there were various circumstances which complicated the situation when Sir John was given the command. The country is mandated territory, possessing a King and a government of its own. Its liberation from the Turks was due to the army in India assisted by the navy. Units of the Indian army remained in the country. For the first time in history an air officer had to take the supreme command over military units. Riots, rebellions, raids, and foreign attacks directed against the King of Iraq had to be dealt with by this air officer. Tribes, whose habits were turbulent but not necessarily seditious, had to be reduced to order with a minimum

of bloodshed. Peace had to be maintained with the minimum of expense. Foreign raiders on the northern and southern borders had to be repelled without provoking, if it were possible to avoid it, a new war. At the same time, a commercial air route had to be laid out by the units of the Royal Air Force across a particularly difficult desert terrain.

Such were some of the problems which confronted Sir John Salmond when he took over the command in Iraq. The weapon with which he had to work had been forged amid the tumult of war, and had not yet "found itself" in peace. To make a success of such a task called for a man not far removed from a genius. Sir John Salmond made a glowing success of this task.

Next came the initiation and organisation of Air Defences of Great Britain. Again, the idea was completely novel. Again, there had never been before anything exactly like it in the history of the world. Sir John's experience in Iraq doubtless provided some precedent in general principles, but nearly all the circumstances were entirely different. Again, guiding principles had to be formulated, and the organisation had to be made to conform to them. Again, tact was required in dealing with authorities not subject to the Air Ministry—for air defence has not yet been recognised as one subject, whole and indivisible. The guns and searchlights are still provided by the War Office. Fortunately there was no difficulty in working with General Ashmore, who commanded the ground defences. The Air Officer Commanding in Chief found his squadrons ready, or at least some of them. He had to organise them into a Fighting Area and a Bombing Area. He found some guns and searchlights available, though not nearly enough. They, too, needed to be fitted in with the general scheme of defence. Of a system of coast watchers he found nothing. From 1923 until a year ago Sir John Salmond laboured at founding and organising his new command. The progress made was tested by a series of air exercises in 1927 and 1928. Lessons were learnt from these exercises, but it was found that the scheme of defence was sound. Sir John had scored another success in an unprecedented task.

As Chief of the Air Staff, Sir John Salmond enters upon yet another stage of his career. The work which lies before him is both different and yet similar to the labours which he has so successfully mastered since the war. This time he has not to make a start from the beginning. Perhaps it would be easier for a man of his ability if he found the slate clean. He is well versed in initiation. To be the second post-war C.A.S. is to undertake a task quite as responsible and probably not much less difficult than to found a new command. There are problems still to be settled, and they are not small problems. The present arrangements for the supply of air units to the army and the navy bear in every way the stamp of temporary expedients. It may be the wisest course to let temporary expedients continue for a while longer. But it cannot be a matter of no concern to the Air Council that the number of squadrons allotted to work with the army is totally inadequate to the needs of the army in war, and that the army shows no disposition to shoulder part of the expense. If the War Office fondly imagines that in time of war the army will be able to borrow air squadrons from Air Defences of Great Britain, this fond hope should be firmly dispelled. The allocation of more squadrons to work with the army means, under present arrangements, an increase in the air vote, which gives the public a false impression of the cost of air defence. It is likewise an injustice to the air vote that it should bear the cost of the school of army co-operation. On the other hand, the Air Ministry should undoubtedly take over the searchlights and guns which are an integral part of air defence. This reform has often been advocated by FLIGHT, and our view has recently received a strong confirmation from no less an authority than General Ashmore himself.

Another point which certainly deserves the attention of the new C.A.S. is the question of using more airmen pilots. As there is every probability that the supply of short-service and medium-service officers will in due time automatically cease, the substitution for them of airmen pilots is likely to become a sheer necessity. If a new move is inevitable, then the sooner it is made the better. This is a development which would be extremely popular with the non-commissioned ranks.

In short, there lies before Sir John Salmond plenty of scope for that power of initiative and of organisation of which he has given such signal proofs in his previous commands. No cut and dried work will be his lot. The Royal Air Force is young and is still growing. We are convinced that the right man has been found to lead it on from youth to maturity.

NEW YEAR HONOURS

Barons

Marshal of the Royal Air Force Sir Hugh Montague Trenchard, Bt., G.C.B., D.S.O. Chief of the Air Staff since 1919; Colonel, Royal Scots Fusiliers.

Sir Charles Cheers Wakefield, Bt., C.B.E., LL.D. For public and philanthropic services.

Order of the British Empire

Civil Division

D.B.E.

The Hon. Mary, Lady Bailey. For services to aviation.

O.B.E.

Capt. Roger Norman Liptrot, A.F.R.Ae.S., M.I.Ae.E., Principal Technical Officer, Air Ministry.

M.B.E.

Henry Lester Butler Tarrant, Esq., Chief Clerk, Meteorological Office, Air Ministry.

Order of the Bath

C.B. (Military Division)

Air Commodore Reginald Percy Mills, M.C., A.F.C., Royal Air Force.

Royal Victorian Order

M.V.O. (Fourth Class)

Sqdn.-Ldr. David Sigismund Don, R.A.F.

Awards to Airmen

Bar to the Air Force Cross

Flight-Lieut. Edward Goodwin Hilton, D.F.C., A.F.C.

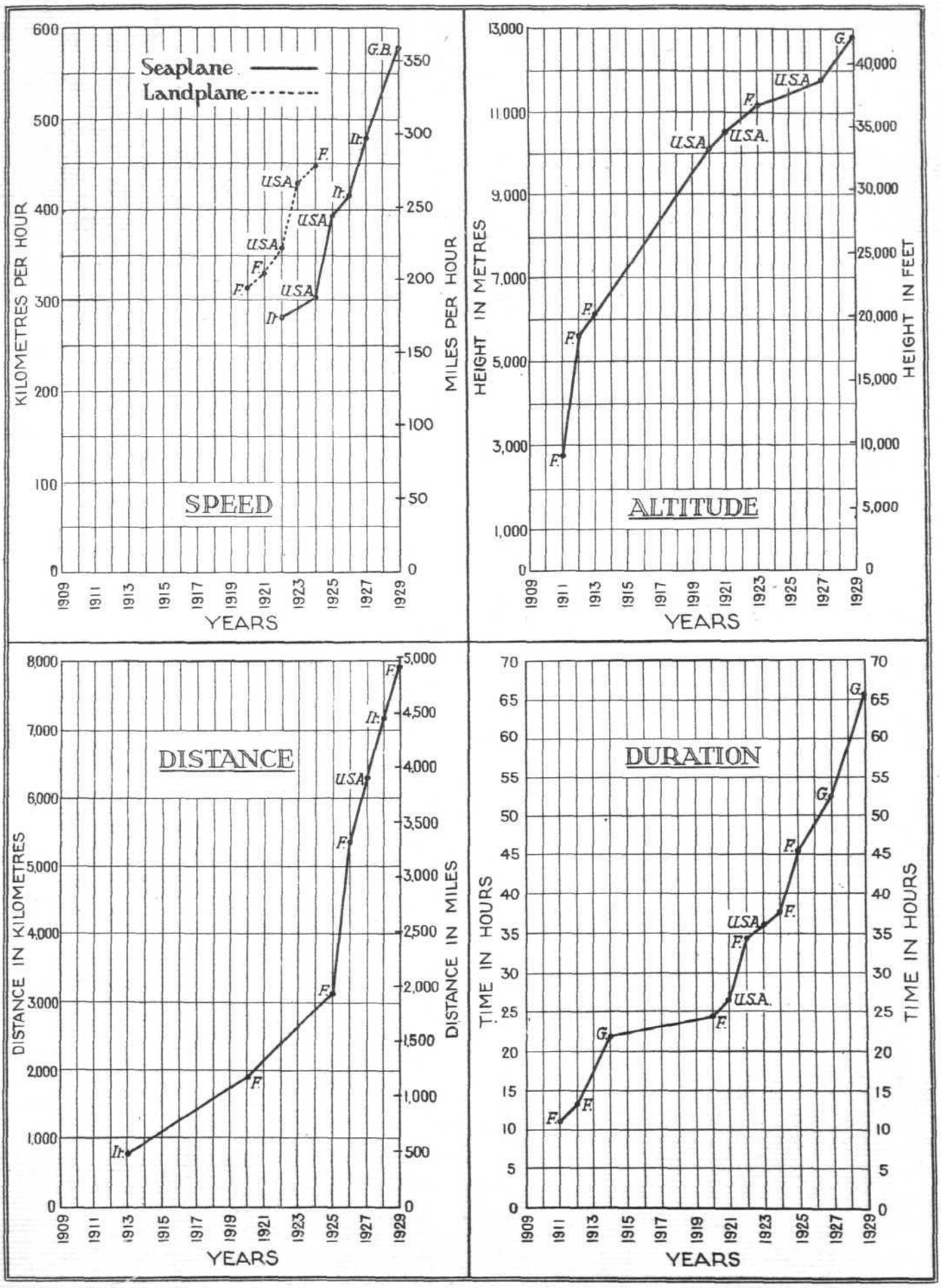
Air Force Cross

Flight-Lieut. John McFarlane, M.C.

Air Force Medal

87076 Flight-Sergt. Joseph Edgar Brown.

F.A.I. FLYING RECORDS



These four graphs show the progress made in the world's principal flying records since records were first recognised by the Federation Aeronautique Internationale. We have selected the four categories which best exemplify the advance in the powers of aircraft, namely (1) speed in a straight line by landplanes and seaplanes ; (2) altitude, without a passenger ; (3) distance flown non-stop from point to point ; and (4) duration without refuelling. The initials used are :—G.B. (Great Britain), It. (Italy), U.S.A. (America), G. (Germany), and F. (France).

ONE YEAR IN THE LIFE OF A CANADIAN COMPANY

The Continental Aero Corporation of Montreal

By A. H. S.

John M. Alexander, President.

J. H. St. Martin, Chief Pilot.

WHETHER the Continental Aero Corporation, Ltd., of 825, Confederation Building, Montreal, and the St. Hubert Airport, has actually broken any records in its brief year of existence is beyond my power to say. Its officers do not boast of having done so. Indeed, they are refreshingly modest in their assertions. They are content to base their claim to recognition on the establishment of a successful and efficient flying school ; on the distribution of one of the machines of recognised merit produced in the United States ; and on securing a volume of business in the space of twelve months which has justified the expansion of their original capitalization tenfold—from $50,000 to $500,000.

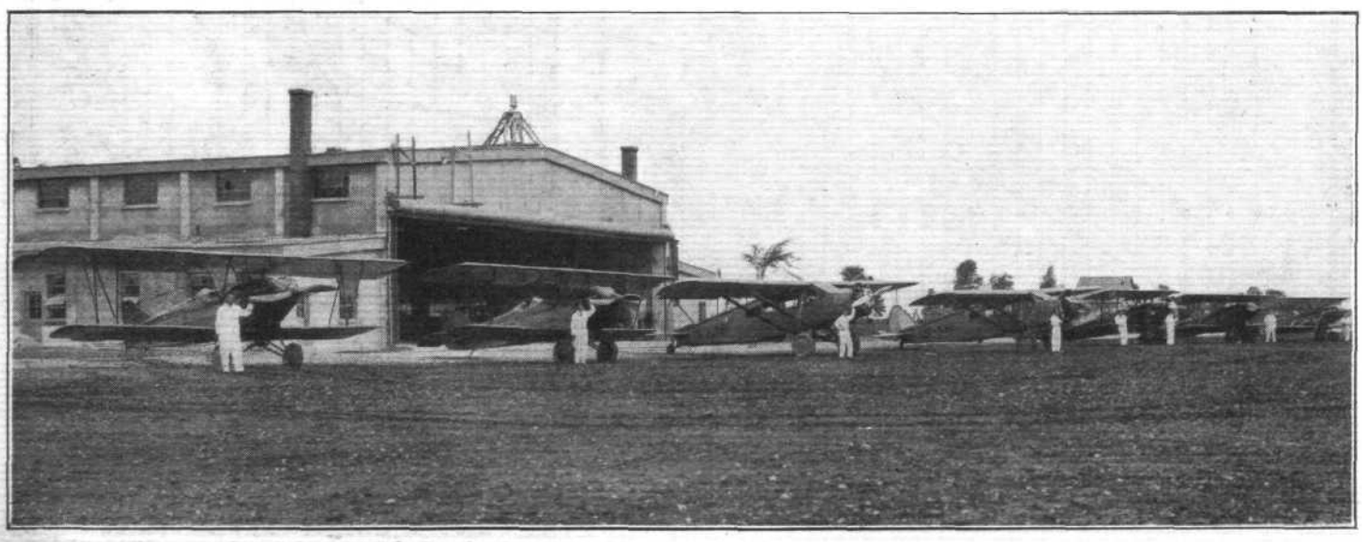
The little matter of the history of their first Travel air machine, " TD " with which they set up business on August 10, 1928, they refuse to regard as being " extraordinary." This " crate," after having spent 897 hours in the air ; having made 13,000 take-offs and landings ; and having been flown by 172 different persons, was sold a few weeks ago with its original undercarriage, wheels, tyres and OX.5 engine intact. They are willing to admit that this is " interesting." It seemed that way to me !

That they should have disposed of $211,000 (£43,000) worth of aircraft in the first seven months of 1929 gratifies, but does not surprise them. They are enthusiastic about the brand of machine they handle, and they point to the demand throughout the Dominion for aircraft of both the types they have to offer, the open-cockpit biplane and the larger, more powerful, cabin monoplane, as the surest criterion of more business to follow.

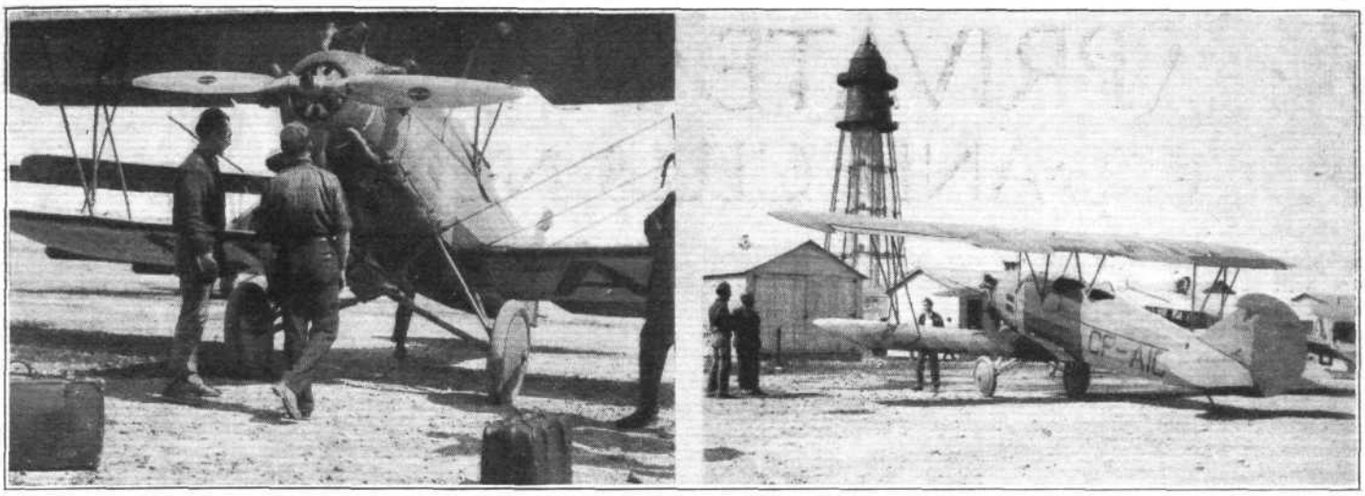
John M. Alexander, president of the company, caught the flying fever when Bleriot crossed the Channel in 1909, and never really got over it. He was a youngster in the small town of Shawville, P.Q., when Bleriot made his famous flight, and his particular chum of the moment happened to be the son of the owner of the local pattern-making shop. The two boys set to work and built a Wright-type glider, which was later followed by a heavier machine in which they installed a 12-h.p. marine engine. The glider actually functioned, but the power-driven craft was somewhat of a disappointment and never left the ground, though it taxied about in clouds of dust and glory.

All through Mr. Alexander's association with the electrical and motion picture industries in Montreal, he retained his belief in the potentialities of aircraft. It was not, however, until the country was engulfed in that great wave of airmindedness that followed Lindbergh's transatlantic flight, that he felt himself justified in engaging in the industry as a legitimate business venture. And the skeletons littering the aviation desert between 1918 and 1927 suggest that his judgment may have been good. It was not until the summer of 1928, in fact, that he spent some time travelling around the States, investigating conditions, to return eventully with one machine, the aforementioned " TD," and the agency for Travel Air machines. When Continental Aero went to the post in August, 1928, it had a staff of three—Mr. Alexander ; Capt. J. H. St. Martin, his pilot ; and Miss Winifred Richardson, secretary and book-keeper. Its capital, on paper, was $50,000, but its assets were mainly the single machine, the agency, and indomitable courage. St. Martin was about all the asset any one man could be, with his years of flying, dating from service with the Royal Air Force through a varied experience of gypsy flying, sometimes known as " barnstorming," passenger-hopping, aerial photography, parachute jumping and every other known activity of the post-war pilot. including some of the earliest service to a prospector on record.

On October 1, a second machine of the same type was put into service, and with the steady accretion of pupils, who at one time reached the handsome total of 69 simultaneously enrolled, the business began to hum. The present fleet consists of seven machines : four OX.5 engined model " 2,000 " Travel Air biplanes used for school work ; one model " 4,000 " open-cockpit biplane with a Wright J.6 engine ; one Travel Air cabin monoplane with a J 6 ; and one with a Pratt and Whitney " Wasp." The branch flying school at Quebec, where instruction is in the hands of H. Simoneau, uses three of these machines. Simoneau came to Continental Aero from the Montreal Flying Club (not the Montreal Light Aeroplane Club), of which he had been the instructor.



The fleet of Travel Air monoplanes and biplanes lined up in front of the Government hangar at St. Hubert Airport.



On the left, a Travel Air "4,000" about to leave for Quebec with passenger and luggage. Right, another Travel Air machine at St. Hubert Airport, with the Airship mooring mast in the background.

St. Hubert Airport, on the opposite (south) side of the St. Lawrence River, is the company's headquarters. St. Hubert, like too many other airports, is a considerable distance from the city it serves, but it will be brought into much closer touch with Montreal when the new high-level bridge across the river is thrown open to traffic. In addition to containing the huge mooring mast, which more or less patiently awaits the coming of the R.100 or R.101, the St. Hubert 'drome is the Customs Airport for land machines entering or leaving Canada across the neighbouring Quebec-U.S. boundary, and—being owned and operated by the Dominion government, is slowly but steadily being prepared to take its place as one of the show aerodromes of the North American continent. Last spring it showed decidedly muddy characteristics. Next spring will show, it is hoped, the effect of the miles of tiling that have been laid in the central of the three sections into which its surface is divided. Not only is the airport itself of vast extent—770 acres—but it is surrounded for miles in almost every direction by as flat a terrain as could be desired, making it an ideal training ground for pupils.

Thirty-eight hundred passengers have availed themselves of the opportunity offered by Continental Aero to see the city of Montreal from upstairs, the fare for this trip being the modest sum of $5. An effort was made in the past summer to popularise a moonlight flight across the river and over the city, glowing with its hundreds of flashing signs advertising everything from real estate to whisky (but mostly whisky), and identified from many miles away by the brightly-lit cross on the slopes of Mount Royal, and by the soft, but far-reaching Neon lights around the top of the Royal Bank Building downtown.

Just a year after business was started, Continental Aero was re-registered as a public company with a capital of half a million dollars, whose shares will shortly be quoted on the Montreal Stock Exchange, and at the same time announcement was made of a new private company named Travel Air of Canada, Ltd., with a capital of $100,000, which is planning the erection of a Montreal factory in the near future. The directorates of the two companies will be closely interrelated.

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THE LATE CHIEF OF THE AIR STAFF

Marshal of the Royal Air Force LORD TRENCHARD, G.C.B., D.S.O., 1st Baron

COL. THE MASTER OF SEMPILL, President of the Royal Aeronautical Society, has sent the following letter to Marshal of the Royal Air Force Sir Hugh Trenchard :

23rd Dec., 1929.

SIR,—It is my special privilege and pleasure as President of the Royal Aeronautical Society to convey to you on behalf of the Council, and all the members of the Society, sincere regret at your relinquishing the post of Chief of the Air Staff on December 31st, 1929.

The Royal Aeronautical Society has seen the Royal Air Force grow from strength to strength under your distinguished leadership, and has earnestly striven to help in the task, the vital importance of which none could gainsay, by furthering developments of a scientific and technical nature.

The appreciation of the Society's efforts that you have been good enough to express from time to time has given great encouragement, but this alone has not been the only benefit that the Society has reaped at the hands of the Royal Air Force.

May I be allowed to express the hope that, although you are relinquishing the post of Chief of the Air Service at the Air Ministry, your interest in the Society's work will not be lessened, but rather increased ?

The Council desire me to tender to you, Sir, their most sincere wishes for your health and good fortune in the year 1930, and all the years that follow.

I have the honour to be,

Sir,

Yours faithfully,

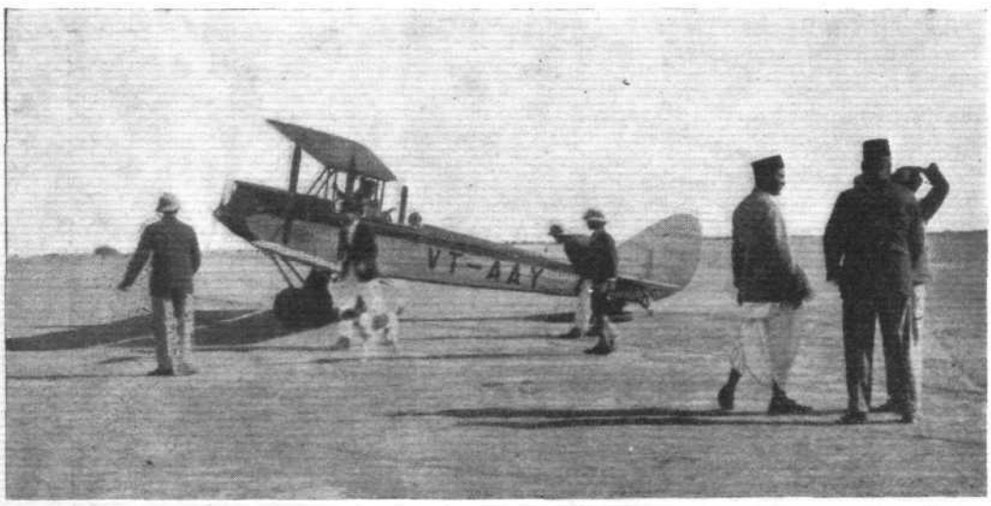
(Signed) W. SEMPILL (*President*).

PRIVATE FLYING AND CLUB NEWS

A MADRAS AERO CLUB has now been proposed, and will shortly be formed if the enthusiasm shown at a recent meeting is continued. Wing.-Commdr. Cooper, representing the Aero Club of India and Burma, presided, and explained the terms of the subsidy, which is available under the existing regulations. At present there are clubs in Karachi, Delhi, Bombay and Calcutta, and it is hoped to form two more at Lahore and Madras. The Government now provide two aeroplanes, a spare engine, a hangar and Rs. 20,000 per annum, but this will be revised in March next.

A CIRRUS-AVIAN won the Benoni Aerial Derby at Baragwanath Aerodrome at Johannesburg on October 20. There were two Cirrus-Avians, four Cirrus-Moths and three Gipsy-Moths in the race, and the course was from Baragwanath to Krugersdorp, then Benoni and back to Baragwanath. Capt. Douglas (Johannesburg Club, Cirrus-Avian) was first, Mr. Robertshaw (Bloemfontein Club, Cirrus-Moth) second, and Miss Nesta Evans (Johannesburg Club, Cirrus-Moth) third. The occasion was one of great importance, and a crowd of some 30,000 witnessed the Air Force Display which followed the race. D.H.9's and S.E.5A's carried out all the usual exploits and evolutions which we in England have become accustomed to seeing done by more modern machines, but from the account to hand it would seem that S.A.A.F. has very ably carried on the traditions of the R.A.F., and despite the handicap of the obsolete machines, every manœuvre was as perfectly carried out as these traditions demand. During the afternoon the Governor-General presented the Johannesburg Club with a Gipsy-Moth on behalf of Sir Charles Wakefield.

THE BOMBAY FLYING CLUB was presented with the Gipsy-Moth, which Sir Charles Wakefield had offered to the first club to turn out eleven *ab initio* "A" licence pilots, on December 2, and Mrs. Petit as the first lady member, at once took up the machine and gave an aerobatic exhibition by way of thanks to the Governor of Bombay, who had performed the ceremony.



SPORTSMANSHIP IN INDIA : The Moth which Mr. Lakhmicard Isardas has lent to the Karachi Aero Club.

THE BEDFORDSHIRE AERO CLUB have been unable to acquire an aerodrome of their own as yet, and are now in contact with the Bedford Town Council with a view to combining and running a combined Municipal-Club Aerodrome. Sites which had previously been chosen at Bromham and Goldington on the north side of the town, have now had to be abandoned, as the town extension schemes clash with them, and further sites will be inspected early in January. We hope that they will have a happy issue from their troubles, and that in the spring we shall hear of an opening meeting at Bedford.

FIJI now has a private owner, a Mr. Nat Chalmers, who has recently imported a Gipsy-Moth.

THE BROOKLANDS SCHOOL OF FLYING has published an exceptionally well-got-up booklet, which answers so many of the questions which prospective pilots wish to know that there is little left for the inquirer to do except go and learn to fly. A foreword by Sir Sefton Brancker, and articles by outside contributors lend a distinctive note to the make up, and the whole tone of the book is entirely in keeping with that air of quiet efficiency which pervades Brooklands whenever one is fortunate enough to be there. A point to be noted when deciding where to go and learn to fly is that the Brooklands School charges no entrance fee or subscription, and the pupil just has to pay for his flying time and nothing else.

THE LEICESTERSHIRE AERO CLUB was formed on the recommendation of the Commercial Aviation Committee of the Leicester Chamber of Commerce, and the first meeting took place in the Board Room of the Chamber of Commerce on November 30, 1928.

The first General Meeting took place on April 5, 1929, when the Club was definitely established.

It had been anticipated that the Leicester Corporation would provide a Municipal Aerodrome, in this, however, the Club was disappointed.

A site for a Club Aerodrome was discovered at Desford. Arrangements have been concluded with Mr. J. H. Cart of Hallfields, who has shown the greatest kindness and helpfulness to the Club.

The total acreage is about 43 acres.

Membership stands now at 221 Members—54 Flying Members, 153 Observer Members and 14 Honorary and Life Members.

On September 14 the Club held its first flying meeting at Desford, when the Under-Secretary of State for Air, Mr. F. Montague, M.P., was present and formally opened the aerodrome. The Lord Mayor and the Mayoress were also in attendance and the Mayoress christened the Club machine the "Quorn."

Between September 13, the date on which the machine was commissioned for flying, and November 30, 136 hours have been flown, and flying has taken place on 58½ days.

Twenty-nine flying members have received instruction and 10 of these have flown solo.

It is contemplated that the next flying meeting will take place at Desford on Easter Monday, and an application for R.A.F. support is at present under consideration by the General Council of Light Aeroplane Clubs.

Steps have been taken to become affiliated to the R.Ae.C., and arrangements have been made to submit Monthly Returns to the Air Ministry.

THE ROYAL AERO CLUB has decided that Great Britain shall enter the round-Europe light aeroplane touring competition initiated by the French Aero Club and won last year by Germany.

Any country entering for this contest must pay a deposit of a sum varying, according to circumstances, from £600 to £800, and the Royal Aero Club has been enabled to enter by contributions from the aircraft industry. The 1930 race will be organised by the German Aero Club.

AIR TRANSPORT

Karachi-Delhi Air Mail Extension

THE Postmaster-General announces that, beginning with the flight from Croydon on Saturday, December 28, letters can be sent to Jodhpur and Delhi by air connecting with the London-Karachi Air Service.

The fee is fixed for the present at 7*d*. per ½ oz. in addition to ordinary postage, and letters for transmission beyond Karachi should be clearly superscribed under the Air Mail label " By Delhi Air Service."

The Postmaster-General understands that the use of the Delhi Air Service will ensure the arrival of letters at Delhi on Sunday evenings as compared with Monday mornings by the ordinary route from Karachi ; and that an acceleration of 24 hours will be gained by letters for Bombay, Southern India, and Ceylon.

Quicker Mails from Australia

FIVE days can now be saved in the time it takes to send a letter from Australia to England, by a reorganisation of the connection with the Indian Air Mail service. This change enables a letter to be sent to England and a reply received in 54 days. This speeding up of the Australian mails has been brought about by altering the day of departure of the air mails from Karachi from Sunday to Tuesday, so that they can bring to England mails landed at Colombo from Australia. The letters will be delivered in London on the day before the closing of the weekly mail for Australia.

Heston Air Park a Customs Aerodrome

HESTON aerodrome has been approved by the Secretary of State for Air as a Customs aerodrome.

Imperial Airways Record

WITH the arrival of an Imperial Airways liner at Croydon from Paris, on December 28, the Imperial Airways completed 5,000,000 miles of cross-Channel flying.

Sir Alan Cobham's Flight

SIR ALAN COBHAM arrived at Entebbe (Uganda) on Christmas Eve, reached Nairobi on Christmas Day, and left for Moshi, Tanganyika, on Boxing Day.

Zeppelin News

DR. ECKENER proposes to begin building LZ 128, a sister ship to the Graf Zeppelin, early in the New Year. It will resemble the Graf Zeppelin in being petrol driven, but will be larger, over 740 ft. long.

Herr Eckener declares that the Graf Zeppelin will definitely not undertake the voyage it had contracted with the International Society Aeroarctic, founded for the exploration of the Arctic regions.

This statement has called forth a sharp protest from the society in question. It maintains that the Graf Zeppelin was bound by contract to undertake the voyage unless the crew refused to accompany the ship, or it should prove impossible to insure the vessel.

The society maintains that the voyage was not put before the crew in a proper light, and that, in spite of Dr. Eckener's statement, it would be possible to insure the airship. Dr. Eckener proposes to undertake a voyage to South America instead of to the North Pole.

Chilean Air Mail Routes Enlarged

A NEW air mail line has recently been opened between Santiago and Buenos Aires. The company operating this service is a Chilean one, and they also have other routes connecting the great cities of South America.

Only a year ago, Chile was separated from New York by 18 days' travel ; from Paris by 20 days, and from London and Berlin by 22 and 23 days, respectively. Today, aerial navigation has placed Santiago 10 days from New York, 9 days from Paris, and 10 from London and Berlin.

The aerial postal service of Chile was inaugurated in February of this year, when a squadron of 20 Moth 'planes were procured for the purpose.

A Mediterranean Disaster

AN Italian seaplane on the Brindisi-Constantinople line which was forced to descend in the Ægean on Christmas Eve is still missing. An official communiqué states that the fallen aeroplane is the I.A.Z.D.B., piloted by Signor Rossi. She had a crew of four, but carried no passengers.

The Hinkler Air Beacon

THE proposal to have an air beacon erected on top of the new State shopping block in Market Street, Sydney, to make night flying safe, has now materialised. The beacon has been officially designated the Hinkler Air Beacon, in commemoration of the great solo flight from England to Australia by Mr. Bert Hinkler.

Mr. Van Lear Black Off Again

MR. VAN LEAR BLACK, former proprietor of the *Baltimore Sun*, arrived at Southampton on December 27 from New York. He now intends to fly from Croydon to Tokyo.

S.A. Developments

OWING to Durban refusing to build an aerodrome larger than 600 yards square, it looks as if Maritzburg may become the Air-Centre of Natal, leaving Durban to be dealt with by a branch line with small aircraft.

Aviation in Kenya

A CORRESPONDENT in Kenya writes :—

" It is usually a feast or a famine in Kenya, and the same may be said of its flying activities. For months, our airport was practically deserted, except for the game, and one particular old gnu, who seemed to spend his time guarding the hangars. Then, late one evening, Capt. Swoffer arrived from England on—KAC, and in a day or two he was undertaking passenger flights and exploring the surrounding country. Three ' Moths ' of N.F.S. were the next arrivals, followed by Mr. John Carberry in his new metal ' Moth ' —AARL. Not content with all this, Mr. Campbell Black must needs put in an appearance from England, on the Avro V —KAE, with passengers.

" On one Sunday there must have been a couple of hundred cars on the ground and 550 people, and it is now becoming quite the thing to roll up and meet friends. A number of people have flown for the first time, one young lady not content with a loop, asked to be taken through a falling leaf, and now regrets that funds do not permit of her learning to fly at present. The N.F.S. 'planes have been making trips to the surrounding territories, and work on landing grounds, in Tanganyika especially, is being pushed ahead. Capt. Swoffer took the Avro V down to Rhodesia with a party recently, and made a quick trip back. Mr. Black, on —KAC, flew to Mombasa from Nairobi and back in a day. He has now gone home by a slower method to bring another machine for Wilson Airlines, Ltd., a Westland IV —KAD. One of the Continental Rothschilds is visiting Kenya in a three-engined 'plane, and Sir Alan Cobham is expected to stay a few hours in Nairobi, on his way south, some time this month. The Prince of Wales' ' Moth,' —AALG, may be stationed here for a week or two early in the new year. The Aero Club's ' Moth,' from Sir Charles Wakefield, is on the water, and there are rumours of other machines being flown out during your winter. It is likely that our list of two private owners will shortly be increased."

American Control of S.A. Aviation

IT is announced that an agreement has been entered into between the Union Airways, Ltd., and General Motors South African, Ltd., whereby Mr. N. C. Tuxbury, a vice-president of the parent corporation and managing director of the South African factory, will join the board of Union Airways, Ltd., immediately, and whereby the closest and fullest co-operation of General Motors in the development of the air mail and passenger services in the Union is assured. It will be remembered that General Motors have acquired a large interest in the Fokker Aircraft Co.

A " Moth " Missing in the Antarctic

A MESSAGE from the Kosmos whaling expedition in the Antarctic says that an aeroplane attached to the expedition and piloted by the Norwegian airman Leif Lier had been away 17 hours at noon on Friday, December 27. With Lier was Ingvald Schreiner, the doctor of the expedition. The machine was a Moth purchased in England last summer and specially equipped for service in the Antarctic. She carried no wireless. Sixteen whaleboats sent on to search had all returned by to-day without finding any trace of the missing machine.

ROYAL AIR FORCE DISPLAY, HENDON

THE Eleventh Annual Display of Flying by the Royal Air Force will be held on Saturday, June 28, 1930, at the R.A.F. Station, Hendon, N.W.9.

Gates open at 10 a.m. Flying commences at noon, and the programme is completed about 5.30 p.m.

New types of aircraft will be exhibited in a special park set apart for the purpose.

The recent completion of the system of arterial roads on the eastern and northern sides of the aerodrome, and the construction of various new secondary roads coupled with the provision by the Display Committee of numerous external car parks at various points around the aerodrome, will do much to alleviate vehicular congestion in future. Inside the aerodrome additional areas will be made available for the use of the public, and augmented seating accommodation both on stands and seats will be available.

Prices of admission will be as heretofore, with the exception of that for parking cars in the 10*s.* enclosure, which will be raised from 7*s.* 6*d.* to 10*s.*

Tickets of admission for spectators to the 2*s.* enclosures are sold only on the day of the Display.

Additional charges will be made for seats on stands as heretofore.

The number of boxes is very limited, and early application should be made to the Secretary for reservation to avoid disappointment.

It is also notified that there will be no internal car parking in the 2*s.* enclosures.

AIR NAVIGATION AMENDMENTS

THE Air Ministry has issued amended Air Navigation directions, which came into force on January 1, 1930. The first section deals with experimental or test flights. Flights carried out solely for the purpose of qualifying for a certificate of airworthiness under "A conditions," shall take place wholly within three miles of a licensed aerodrome, a R.A.F. aerodrome, an aerodrome under the control of the Air Minister, or an aircraft factory, and must not take part at all over a populous area. In "B conditions" a flight to qualify for a C. of A. or for experiment or test, shall be carried out under the control of a person or firm specially approved by the Air Minister, and the aircraft shall have been designed and constructed by a person or firm so approved. In this case the three mile limit does not apply, but no part of the flight shall take place over a populous area.

Every British aircraft capable of carrying 10 or more persons shall, when carrying passengers or goods for hire or reward, carry wireless apparatus of approved type capable of sending and receiving. This, however, may be dispensed with when there are no ground stations in range during the flight.

A qualified navigator must be on board an airship on every flight and on an aeroplane used for international carriage of passengers or goods which has to fly more than 100 miles without alighting. A pilot who is also a qualified navigator may navigate the machine on day flights over inhabited regions, on day flights of not more than 625 miles over the high seas, or uninhabited regions, or on night flights on recognized and suitably marked routes. A flight over the high seas means reaching a distance of more than 65 miles from the coast.

FAIREY AVIATION CO., LTD.

THE control of the Air Survey Co., Ltd., of which Messrs. Ronald Kemp and F. Raynham are the moving spirits, has been acquired by the Fairey Aviation Co., Ltd. This interesting fact was announced by Mr. C. R. Fairey, chairman and managing director of the latter company, at the first ordinary general meeting of the shareholders at Winchester House, Old Broad Street, E.C., on December 20, 1929. Messrs. Kemp and Raynham have done a great deal of useful air survey work in India, Burma, Malaya and Borneo in the last six years. At present the Air Survey Co., Ltd., is also engaged on a contract in the Sudan. The A.S.C., said Mr. Fairey, had made losses prior to being taken over, but his company would endeavour to put it on a profit-making basis.

Mr. Fairey was able to make the satisfactory announcement that the year's working over the period October 1, 1928, to September 30, 1929, showed a profit of £164,953 11*s.* 1*d.* A dividend of 7 per cent. less tax on the ordinary shares was approved.

THE SCHOOL BOYS' EXHIBITION

THE School Boys' Exhibition, opened by Mr. Esmond Harmsworth on December 31, which the *Daily Mail* has arranged at the Horticultural Hall, Westminster, has a great deal of interest to those boys who are following the spirit of the age and growing up air-minded. The Air League has a stand which includes a variety of interesting exhibits such as the Reid testing apparatus in which the boys are allowed to try their hand at control column; an historical section with many models and photographs; an instrument section showing the internal working of many of the ordinary instruments; an engine section where three representative engines, the Napier Lion, the Cirrus-Hermes, and the D.H. Gipsy are shown, a survey section showing how aircraft are used for this important work and in addition films are being shown each day.

Conducted interesting visits are also being arranged from the Exhibition to the D.H. works, the Fairey works, and Croydon aerodrome.

R.AE.S. AND INST.AE.E.

Official Notices

ON Thursday, January 9, 1930, will be given the opening lecture of the second half of the 1929-30 Session. The lecture will be given by Mr. McKinnon Wood on The New American Wind Tunnels, in the lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2. Mr. McKinnon Wood gives very full details of the new tunnels, together with comparative tests, and shows why the compressed air tunnel, the "full scale" tunnel and the "full speed" tunnel are necessary for the future development of aeronautics.

Lecture Programme

Second Half of Session, 1930

Jan. 9.—Mr. R. McKinnon Wood, O.B.E., F.R.Ae.S., A.M.Inst.C.E. "The New American Wind Tunnels."

Jan. 23.—Mr. H. B. Howard, B.A., B.Sc., A.F.R.Ae.S. "Certificates of Airworthiness."

Feb. 6.—Mr. J. W. Maccoll, B.Sc., A.F.R.Ae.S. "Modern Aerodynamical Research in Germany."

Feb. 13.—Senr. J. de la Cierva. "Recent Work on the Autogiro."

The above lectures will be held in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2.

Wednesday, Feb. 19.—Dr. Walter Georgii. "Gliding."

In the Lecture Hall of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

Feb. 27 (7.45 p.m.). Mr. A. J. Rowledge, M.I.A.E., F.R.Ae.S., A.M.Inst.C.E. "Latest Developments of Aero Engines."

Refreshments will be served from 1.15 onwards in the Library of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2. Joint Lecture with Institution of Automobile Engineers.

March 6.—Major F. M. Green, O.B.E., M.Inst.C.E., F.R.Ae.S., and Mr. H. C. H. Townend. "Resistance of Air-cooled Engines and the Townend Ring."

In Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2.

March 10 (5.30 p.m.). Herr M. Wronsky. "Air Transport."

In Lecture Hall of Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. Joint Meeting with Institute of Transport.

April 3.—Mons. P. Grimault. "Operation of the Aero-Postale Service in Europe."

In Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2.

Except when stated otherwise, lectures commence at 6.30 p.m.

The dates of further lectures will be announced later.

Visitors are admitted to any lecture on signing the Visitors' Book with their full name and address.

CAPTAIN J. LAURENCE PRITCHARD,
Secretary.

THIS PROGRESS

THE CONQUEST OF THE AIR

ABOUT OURSELVES

TWENTY-ONE YEARS ago FLIGHT made its bow to the world with a modest 16 pages of editorial matter and six pages of advertisements. At that date, looking back, it required quite a modicum of aeronautical enthusiasm to embark, in the words of several of the friends of the founder, upon so lunatic a venture. Bedlam or Colney Hatch were even mentioned *sotto voce*. But in spite of adverse criticism it was decided to take the plunge and thus was FLIGHT born on January 2, 1909. As a fact, some eight numbers under that title had appeared for the previous eight weeks for the purpose of securing the Copyright in the title (at that date the law of Copyright had not got down to the "2*d*. right" stage), which title again was, amongst one's friendly critics, a title greatly to be deplored. Why not "The Age of Flight," and a dozen variations thereon? But here there was again no wavering. FLIGHT it was and FLIGHT it was to remain. And from that day, through the years of missionary work, no sign of pessimism was in evidence with its founder, who pinned his faith to the opinion that with the dawn of the conquest of the air, the world was eventually to see the greatest revolution in progress the world had ever known. And that opinion still holds good.

In this connection, his faith in persevering was helped by a short note of encouragement from the late Lord Northcliffe, that wonderful Aladdin of the journalistic world, in which he spontaneously stated that he could not refrain from offering his congratulations to the Editor upon the valuable work which FLIGHT had done, without which, he stated, aviation would have been much more backward in its progress than was the case.

All this optimism, however, would have been but drifting air had it not been for those who helped to maintain the interest of the subject week by week and year by year. The Editor has been supremely fortunate in enlisting the work and enthusiasm of those who helped to that end, and it is entirely due to the whole-hearted work and judgment of the Editorial Staff of FLIGHT, and those responsible for the commercial side of the undertaking, that the little baby has been enabled to emerge from its childhood and weather the many lean and trying years which it was necessary, in the earlier days, to overcome. It has been the sound, unbiased judgment of the Staff in the handling of Editorial matter from week to week that has enabled FLIGHT to have attained its present leading position and world-wide reputation for accuracy and helpful information. And to them, on behalf of the founder and of our host of readers, most grateful thanks are offered.

That an occasional slip may have crept in goes without saying, but it has always been rather a pleasant, than an objectionable task to correct any such error, having in view the close interest taken by our readers which thereby was evidenced.

Incidentally, prior to the founding of FLIGHT in 1909, track of all matters aeronautical had, for many years, been kept in our contemporary and sister journal *The Automotor Journal*. It was only when the promise of practical progress in mechanical flight appeared to be at last in view that the subject was deemed worthy of a separate organ to voice its needs. Perhaps it is not out of place to quote here the first Editorial paragraph of No. 1 of FLIGHT, in this connection :—

> "It is not as a youthful stranger—entirely unknown to the aeronautical world—that we seek to introduce ourselves to everyone who is taking a special interest in mechanical flight; but rather as the dutiful offspring of a journal which has, for long, earned the esteem of the same public, that we hope to make a successful appeal for FLIGHT today. Up to the present time, when our own advent upon the scenes has synchronised almost exactly with the birth of a new era for humanity—the flying age—the pre-natal interests of the great industry, which is, from now onwards, to be our special charge, have been cared for, and the way prepared, by *The Automotor Journal*. That parent journal has for many years assiduously chronicled all the early stages which have of late culminated so satisfactorily in the conquest of the air. But it now devolves on us, as a new-comer, to take up the running in columns of our own; since the time has undoubtedly arrived when the aeronautical movement can no longer be dependent on an automobile foster parent, however honoured that parent may be. It is, then, our firm determination to establish the same lofty traditions for FLIGHT that have ever guided the editorial pen of *The Automotor Journal* in the automobile sphere, our chief aims and objects being ever to throw our full weight on the side of all that seems to us to make for the highest permanent good of the aeronautic industry, to pursue a policy of entire independence, and to render our pages as interesting, concise and accurately instructive as lies without our powers."

We have always endeavoured to carry out these views, and it is for our present-day readers to say if we have lived up to the promise given at our birth.

It is with pleasure we record that FLIGHT, at the invitation of the Committee of the Royal Aero Club, from the first, was accorded the honour of being the Club's official organ, and at its completion of its 21st year, it still so remains, without a break.

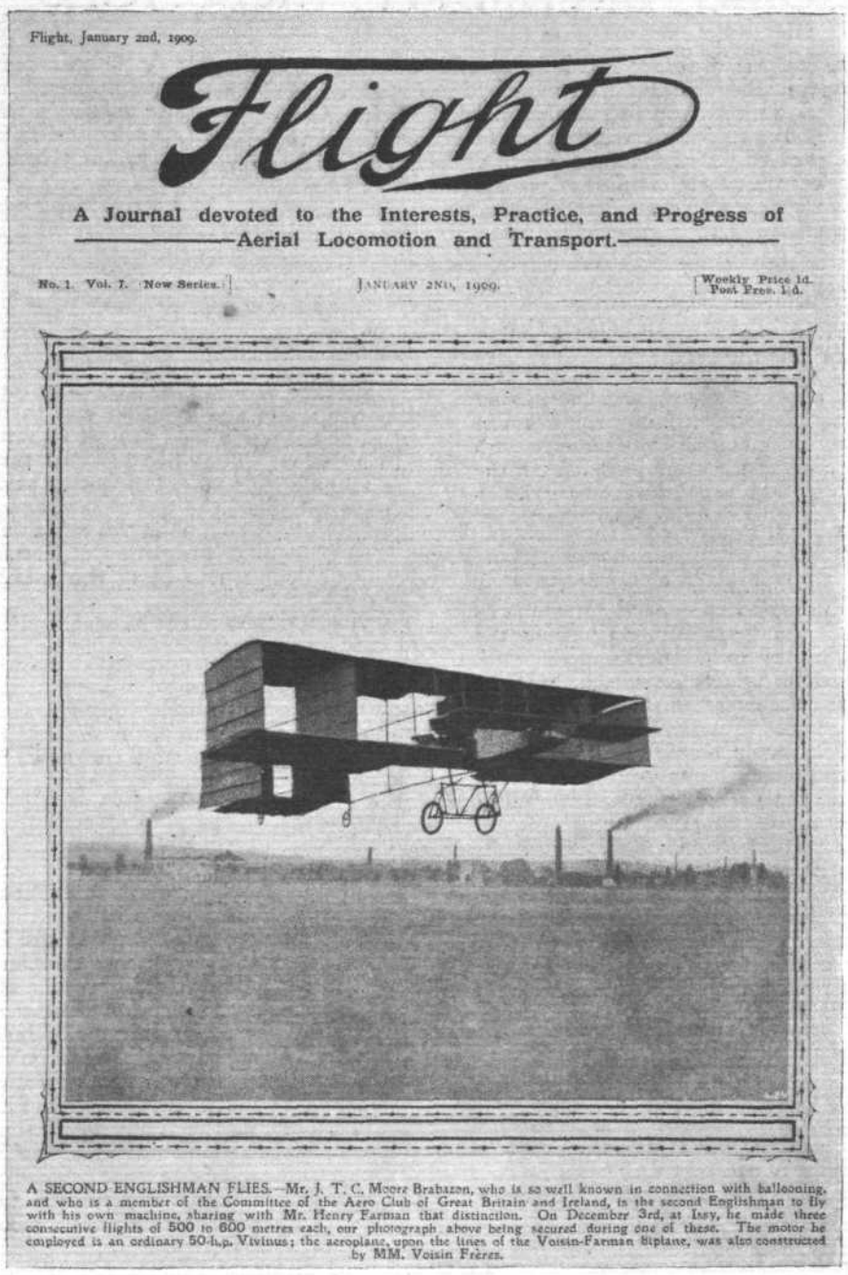
May I here offer in advance my thanks and appreciation to those friends who, through the Royal Aeronautical Society, have seen fit to mark FLIGHT's coming of age by arranging a dinner at the Savoy Hotel on Friday, January 3, to celebrate our 21st anniversary, to which they have bidden me as Founder and Editor. This great compliment I have gladly accepted as an honour thus paid through me to FLIGHT as a whole and the entire staff, who have enabled the high character of the paper to be maintained throughout its career. And on their behalf my grateful thanks are offered for that appreciation.

In conclusion, I would also thank the thousands of readers who have, through FLIGHT's pages, kept in touch with us and the great aviation movement. It is their ever increasing support which encourages us to continue and press forward to greater efforts to deserve their confidence and continued backing. May that intimate association continue and last for many years to come.

And now, with best wishes to all our readers for a Happy and Prosperous New Year, and our sincere thanks for the huge sheaf of Birthday Messages to hand, let these latter and others convey their thoughts upon FLIGHT's past and the progress made during its twenty-one years of existence.

Stanley Spooner.

Ourselves.



Flight, January 2nd, 1909.

Flight

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

No. 1. Vol. I. (New Series.) JANUARY 2ND, 1909. [Weekly Price 1d. Post Free 1½d.

A SECOND ENGLISHMAN FLIES.—Mr. J. T. C. Moore Brabazon, who is so well known in connection with ballooning, and who is a member of the Committee of the Aero Club of Great Britain and Ireland, is the second Englishman to fly with his own machine, sharing with Mr. Henry Farman that distinction. On December 3rd, at Issy, he made three consecutive flights of 500 to 600 metres each, our photograph above being secured during one of these. The motor he employed is an ordinary 50-h.p. Vivinus; the aeroplane, upon the lines of the Voisin-Farman biplane, was also constructed by MM. Voisin Frères.

UPON completing 21 years of publication of FLIGHT, it has seemed to us of interest to give a review of the progress made in flying during the last two decades. It was, we can assure our readers, no easy task to decide what form such a review should take, and many different "schemes" were discussed before a decision was reached. We believe, however, that the manner of presentation chosen will meet with the approval of most of our readers. Space being a very important consideration, we have decided, as regards the review of aircraft, to make this largely pictorial, even a small photograph giving a much better idea of a machine than descriptions occupying a much larger space. Furthermore, it very soon became obvious that we should not have the space to publish photographs of more than a small percentage of British machines produced during the last 21 years. That being so, the bulk of the photographs published on pages 31 to 66 show pre-war aircraft.

Our Correspondence columns have of late indicated that there exists among readers a widespread desire to be told something of the "Old Times," and we feel that these photographs of pre-war machines, although being no substitute for articles specially devoted to the subject, will serve to show what manner of mounts the early aviators had to fly. The photograph on this page, which shows the first page of the first number of FLIGHT, illustrates Moore Brabazon's Voisin biplane of late 1908, and this is an excellent example for comparison with modern aircraft.

By way of explaining and describing in a more technical way the progress made in 21 years, we have asked a number of specialists to review their own particular sphere, and the response has been most gratifying. There are, however, two omissions for which we should here apologise: We had asked two world-famous British designers to write for us their impressions of twenty-one years of progress, one to deal with the aerodynamic design of aircraft and the other with the progress in structural design. It was, however, found that one designer was abroad and would not return until Christmas, *i.e.*, too late to give him time to do the article, while the other was so extremely busy with his ordinary work that he could not spare the time. We feel that FLIGHT's review of the last two decades is somewhat incomplete without these two articles, but there was no help for it, and we had to go to Press without them.

The articles which we do publish, dealing with subjects other than general practical aircraft design, will, we think, be found to be of surpassing interest, and we are especially gratified that the authors, all well-known in the British aviation world and all very busy men, should have found the time to give FLIGHT readers the benefit of their specialised knowledge of the subjects dealt with.

SOME BIRTHDAY MESSAGES

From far and near, from at home, from the Dominions and from abroad, birthday messages have reached us as a result of the reminder that with this week's issue FLIGHT *completes 21 years of publication. Although we had naturally hoped that a few of our readers would wish us "Many Happy Returns of the Day," we were rather unprepared for the flow of messages by post, telegraph and cable which have been arriving at our office during the last week or two.*

It is quite impossible, in the space which we are able to devote to them, to publish all these messages, much as we should have liked to do so. But below we give a selection in the belief that our many readers will be interested to read the messages which so many famous and prominent people have been kind enough to send us.

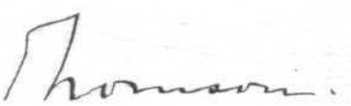
Where messages have arrived by post we reproduce the signatures in facsimile.

From BRIG.-GENERAL THE RT. HON.
LORD THOMSON OF CARDINGTON, C.B.E., D.S.O.,
Secretary of State for Air.

"It gives me very great pleasure, as Secretary of State for Air, to congratulate FLIGHT on the attainment of its majority. Twenty-one years ago aviation was in its infancy; flying, as we know it to-day, had scarcely begun, and it was a bold project to embark on the publication of a weekly paper devoted solely to aviation. Time has justified the venture, and FLIGHT has now surely established itself as a stimulating and authoritative periodical of interest alike to the amateur and the professional—to the pilot, the technician, and the man in the street.

"If I may refer to one feature, I would particularly commend the valuable encouragement which, as the official organ of the Royal Aero Club, it is the policy of FLIGHT to give to the light aeroplane club movement—a movement calculated to be of the greatest importance for the development of aviation in this country.

"I am sure that all interested in aviation will join with me in wishing FLIGHT continued success and prosperity."



From MR. F. MONTAGUE, M.P.,
Under-Secretary of State for Air.

"It is with the greatest of pleasure that I offer my congratulations to FLIGHT upon the celebration of its twenty-first birthday.

"The establishment of FLIGHT 21 years ago showed, indeed, a wonderful foresight in the potential development of the conquest of the air. But even that foresight can hardly have envisaged the enormous development during the period in question, not only of military aviation, but of commercial aircraft as a means of improvement in communications in times of peace.

"The development of civil aviation throughout the world is really just beginning, and in the future years of inevitable expansion one will look to FLIGHT to record all items of interest and importance, both technical and general, as attractively and efficiently in the future as it has done in the past."

From AIR CHIEF MARSHAL
SIR J. M. SALMOND, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C.,
Chief of the Air Staff.

"I am glad to be able to congratulate FLIGHT on attaining the 21st year of its publication, which sees it well established as, I believe, the oldest purely aeronautical weekly in the world. Not only is the journal the official organ of the Royal Aero Club of the United Kingdom, but, it serves a wide area of diverse interests for the interchange of ideas on all aspects of aviation.

"Its features of editorial comment, of matter relating to private flying, light aeroplane clubs, engines and the engineer, reviews of books, and as a means for the dissemination of official information are of incalculable value to the aeronautical world.

"I wish it and its founder (who is also its present editor) continued prosperity and success."

From AIR VICE-MARSHAL SIR SEFTON BRANCKER, K.C.B., A.F.C.,
Director of Civil Aviation.

"I congratulate FLIGHT on completing the twenty-first year of a most useful and patriotic existence. May FLIGHT live and prosper, continuing the good work, so soundly and so painstakingly accomplished in the past, through centuries of the future. I wish you 'Many happy returns of the Day' with all confidence and sincerity."

Birthday Messages—*continued*

From the RT. HON. SIR SAMUEL HOARE, Bart., G.B.E., C.M.G., M.P.,
Late Secretary of State for Air.

" I am delighted to be able to congratulate FLIGHT upon coming of age. The paper has proved itself a pioneer, for its existence has covered almost the entire period of British flying. Its Editor and readers must now be feeling happy that the gospel that it has preached for 21 years is at last being accepted by the British public. The next 21 years of its existence will see a great development of British aviation. The first chapter, the chapter of tentative experiment and hesitating preparation, is over, and the next chapter, the chapter of bold expansion and imaginative development, is at hand. I hope and believe that FLIGHT will play a useful part in hastening the coming of the new dispensation."

Samuel Hoare

From SIR PHILIP SASSOON, Bart., G.B.E., C.M.G., M.P.,
Late Under-Secretary of State for Air.

" It is an occasion such as this, when the first of our aeronautical journals—the oldest newspaper, I believe, to be exclusively devoted to the subject of flight—celebrates its twenty-first birthday, that brings home to one how young a development flying really is, and how rapid has been its progress. Compared with the history of any other form of locomotion, mechanical flying easily takes first place for the speed with which it has passed from a halting and uncertain experiment to a recognised everyday means of transit.

" It is this fact which chiefly encourages those who believe most firmly in the yet greater development of this young science and art, and justifies the foresight of those who, like the Editor of FLIGHT, have devoted themselves to its advancement. What may we not reasonably hope to have accomplished at the end of another 21 years ? Flying has had, and no doubt still will have, its set-backs and disasters ; but its progress is assured and with it the increasing triumph of man over the limitations of time and distance.

" When the day comes, as come it must, that the surface of the globe is netted by an established system of air lines operating steadily and regularly in all climates and almost all conditions of weather, those who then enjoy the wonderful facilities for trade and intercourse which will lie ready almost at their door will look back, I hope, with gratitude to those early pioneers to whose faith and effort they will owe their unparalleled advantages. No one will have greater cause to thank those pioneers than the peoples of the British Empire who, if they rightly use their opportunities, will find in air transport the solution of many of their social, political and economic problems.

" Remarkable as the record of less than a generation has been, I believe that we are on the threshold of an era of still more rapid progress in the exploitation of the air. Since the appearance of those strange and flimsy machines which first demonstrated that man was no longer earth-bound, the design of aircraft and power units have changed enormously. Change is still the order of the day. Day by day new experiments are being made, new knowledge and experience are being gained. Many of our own generation will live to see the realisation of fresh advances which will make the engines and machines of today appear almost as curious and rudimentary as the machines of 1906 seem to us.

" Speed will increase, size will grow, safety will become more assured. Flying will lose what novelty it still retains. The nations of the world will learn to know each other. The aeroplane and airship alike will in time come to lose their present association with the worst horrors of war. War lives as much by ignorance and misunderstanding as by greed and lust of power. Flight is breaking down the natural barriers which nature has set between the nations of the world and their understanding of one another. It is a sure instinct which has made man for countless generations endow angels with wings. Time may yet prove that the Gotha and the Zeppelin were the heralds of world peace."

Philip Sassoon.

From the RT. HON. LORD WEIR OF EASTWOOD,
Late Secretary of State for the Royal Air Force.

" Allow me to offer my heartiest congratulations to FLIGHT on its majority. I think it was the first in the world field of aviation journalism, and has played its part in achieving that high standard which is characteristic of British technical journalism.

" FLIGHT has recorded the entire history of British aviation, the pioneering and then the feverish expansion period of the War, and it is with great interest and pride that one can review the highly creditable performances of British machines, engines, and pilots during the last twelve months. Our aviation industry must necessarily look to a world market, and its technical press is its most important ambassador.

" I send, therefore, my best wishes for your continued prosperity and success."

Weir

From MR. W. LEACH, M.P.,
Late Under-Secretary of State for Air.

" My short period of office at the Air Ministry convinced me that the people associated with aviation, civil and military, are among the most public-spirited, competent, and warm-hearted folk on earth. If civil aviation does not bloom and prosper it will not be their fault. As for military aviation, the most dreadful war weapon so far forged, if international relationships were left in the hands of men like that distinguished officer and (I am proud to say) my friend Sir Hugh Trenchard, it would never be used at all. He would promote a world that would have no need of it."

William Leach

Birthday Messages—*continued*

From HIS EXCELLENCY THE RT. HON. MAJ.-GENERAL
SIR FREDERICK SYKES, G.B.E., K.C.B., K.C.I.E., C.M.G.,
Governor of Bombay,
Late Controller of Civil Aviation.

"Congratulations. Best wishes for the future."

From the HON. MR. A. E. GREEN,
Minister for Defence in the Commonwealth of Australia.

"I heartily congratulate FLIGHT on the attainment of its majority, and, seeing that it is the official organ of the Royal Aero Club, perhaps it would not be inappropriate if at the same time I were to make a brief reference to the flying club movement in Australia and pay a deserving tribute to the fine work done by the associated aero clubs of the several States since the inception of active flying training since 1926. The enthusiasm and efforts of these bodies have undoubtedly resulted in a quickened public interest in aviation and have contributed very materially to the expansion of private and commercial flying throughout the Commonwealth."

From GROUP-CAPTAIN R. WILLIAMS, C.B.E., D.S.O., R.A.A.F.,
Chief of the Australian Air Staff.

"Australian service airmen congratulate FLIGHT on the anniversary and hope for its continued success as a medium for the distribution of British service and civil technical aeronautical information."

From the AIR SERVICE BRANCH OF THE
DEPARTMENT OF NATIONAL DEFENCE, OTTAWA, CANADA.

"Canadian readers of FLIGHT in all branches of aviation join in sending their heartiest congratulations on your majority and best wishes for the future. The success of FLIGHT's long record of service in the advancement of aeronautics on sound lines is appreciated from coast to coast in the Dominion."

From LIEUT.-COL. F. C. SHELMERDINE, O.B.E.,
Director of Civil Aviation in India.

"Aviation in India is still in its infancy, but it congratulates FLIGHT on attaining its majority."

From LIEUT.-COL. SIR PIERRE A. VAN RYNEVELD, K.B.E., D.S.O., M.C.,
Director of the South African Air Force.

"Congratulations. I hope your good work in maintaining interest in the development of aviation among many readers overseas will continue energetically."

From GENERAL VAN CROMBRUGGE,
Director-General of Civil Aviation in Belgium.

"Je vous adresse mes meilleures et mes plus vives félicitations à l'occasion du vingt et unième anniversaire du FLIGHT. Si on se reporte en janvier 1909, il fallait une certaine dose de courage et une grande confiance dans l'avenir pour oser créer un journal s'occupant exclusivement des choses de l'aviation.

"Votre fondateur et rédacteur en chef mérite donc d'être cité parmi les précurseurs de l'aviation, parmi ceux qui, dès le début, se sont rendu compte du développement magnifique réservé à cette nouvelle branche de l'activité humaine.

"Que de chemin parcouru depuis vingt ans. L'avion qui, pour le grand public paraissait être un jouet à la portée de quelques cerveaux brûlés, est d'abord devenu, pendant la guerre mondiale, un instrument de combat à nul autre pareil et dont aucune armée au monde ne pourrait plus se passer, mais, ce qui est mieux, il peut être considéré, à l'heure actuelle, comme un moyen éminemment pratique de communication rapide. Il ne connaît plus d'obstacles, ni les mers, ni les déserts, ni même les solitudes glacées du Pôle.

"Je termine ce bref message en vous exprimant cette pensée, qu'on ne pourrait trop répéter et qui acquiert de jour en jour plus de force, c'est que l'aviation, en raccourcissant les distances, rapproche les peuples et doit être considérée comme un des plus puissants instruments de paix et de concorde entre les diverses nations.

"Les progrès que l'aviation est encore appelée à faire, et fera, contribueront certainement à réaliser cet idéal de paix, qui doit être le but à atteindre pour tous les hommes de bonne volonté et par ceux qui ont participé à la dernière guerre.

"C'est là mon voeu le plus sincère : je suis sûr que c'est aussi le vôtre et celui de tous vos lecteurs."

R. Van Crombrugge

Birthday Messages—*continued*

From ANTONIN SRBA, former Czechoslovak Minister for Public Works and Aviation, Hon. President of the Association of Czechoslovak Pilots.

"During the last twenty years much has been done for the conquest of the air and still more yet awaits us. Every bird, every flying insect shows us now far Nature still is in advance of us as regards safety and economy of flight. But the development of aviation is proceeding so rapidly that in the course of a single generation it has made as much progress as was achieved by the whole of antiquity and the Middle Ages in the mastery of the sea. Thousands of brains and hundreds of thousands of hands have once and for all established a definite technical basis for aviation. This is the joint labour of all civilized nations of the world on behalf of the common culture, economic prosperity and political intercourse of mankind.

"To us in the Czechoslovak Republic, however, the discovery of flying means much more than to the maritime nations, such as the English, French, etc. The latter by the mastery of the air merely acquire another sea in addition to the one the waves of which wash the shores of their countries. Since time immemorial they have possessed their 'high road of the nations,' linking them with all parts of the world, but we, an inland nation, who, from the earliest times, have been settled in the midst of the mountain strongholds of our Central European home, surrounded by nations of a different race and language, have always deplored our remoteness from the sea. The discovery of aviation has liberated us from this. We, too, now feel that we are on the shores of a world-wide ocean. And we also are acquiring an immediate and easily practicable connection with all the rest of the world.

"We are aware how significant this circumstance is and that is why we are making such efforts to keep abreast of other nations in the manufacture of aeroplanes and aeroplane engines, etc., the organisation of our own transport routes and in the training of pilots. That, too, is why we are such attentive pupils of English aviation, with its wealth of experience and ample resources. FLIGHT can justly be proud of English aviation, while English aviation can entertain the same feelings towards its distinguished mouth-piece and pioneer, the weekly journal FLIGHT, with the celebration of whose twenty-first anniversary Czechoslovak aviation respectfully associates itself."

Ant. Srba

From CAPTAIN A. GRANDJEAN, Royal Danish Navy, Chief of Danish Naval Air Service.

"To us the progress and development of aviation during the past two decades seem marvellous, but I feel convinced that to future historical eyes it shall rather look like stumbling steps towards the final utilization of the element which surrounds all the globe and through which the activities of mankind in the universe must be advanced.

"The flight of imagination finds its best sustention in the atmosphere."

A. Grandjean

From COLONEL V. A. VUORI, Chief of the Finnish Air Force.

"The history of civilization is the history of communications. Each period of development requires the improvement of the means of transport. Ship, railway and automobile have developed and been taken into use. We now live in a new mighty stage of development, viz., that of aviation.

"I have the great honour to give my opinion on aviation in the 21st birthday issue of FLIGHT. The progress of this excellent periodical illustrates, moreover, in a wonderful way the development of aviation in general. The first tottering steps, the furious compulsory development during the Great War, the easily understandable reaction following the same, and now a powerful continuous period of rising, the milestones of which can be sketched but hardly determined.

"I am glad to ascertain that the energetic work which is nowadays carried on by all civilized nations for conquering the air is fertile. All the most important centres of Europe and the United States are in regular connection with each other by air—to our regret not yet by night traffic. The long intercontinental lines which it seemed not long ago to be impossible to realize are now working successfully. A new record which appears to-day unobtainable is to-morrow antiquated, beaten. The best example is the hasty rise in the speed of the aeroplane. The speed obtained by the British Schneider Cup Team this autumn would, four or five years ago still have been looked upon as fantastic. The technical progress in all branches of aviation and every improvement is a step forward towards safety, regularity and profitableness. If the peaceful development is allowed to continue, there is every reason to presume that the Air Transport will, in the near future, 'fly by itself.'

"It must, however, be admitted that this new means of locomotion and communication has not yet obtained the support which its great advantages presuppose. But new and ever new palpable proofs of regularity and safety will increase the demand. The interest and support of the public are, however, the fundamental presumptions for the development of civil aviation. They are maintained and developed just by such measures as the flight round England by Sir Alan Cobham and by the encouragement of sport flying. The youth, what an excellent soil! it is on them that the future depends.

"All nations—great and small—ought to be anxious to utilize the advantages offered by this wonderful field of activity to enhance the feeling of solidarity between the nations. The purely national endeavours form, unfortunately, still a considerable hindrance to the development of the spiritual and economic powers of humanity in this sense.

"The chief objects of aviation are: political approach between nations, development of commerce and progress of science."

V. A. Vuori

Birthday Messages—*continued*

From REICHSVERKEHRSMINISTER DR. STEGERWALD,
Chief of German Civil Aviation.

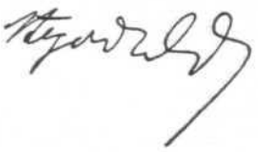
" Als vor 21 Jahren in verschiedenen Ländern die ersten flugtechnischen Fachzeitschriften entstanden, da ahnte man bereits, dass dem Menschenflug eine grosse Zukunft beschieden sei Aber niemand konnte vorhersehen, welche umwälzende Entwicklung in einem halben Menschenalter das Flugzeug erleben würde, und noch dazu, ohne seine ursprüngliche Grundform und das Prinzip seiner Wirkungsweise wesentlich zu ändern.

"Von allen Umwälzungen auf flugtechnischem Gebiet scheint mir aber doch die grösste die zu sein, die das Flugzeug in allen Ländern der Welt und ganz besonders in meinem Vaterlande erfahren hat, als es unmittelbar nach dem Kriege aus einem äusserst spezialisierten Kampfwerkzeug zu einem Instrument des friedlichen Verkehrs umgeschmiedet wurde.

" Die Wege der militärischen und der zivilen Luftfahrt haben sich getrennt.

" Auf beiden Gebieten vollzieht sich eine gewaltige technische Entwicklung mit völlig entgegengesetzten Zielen : Die militärische Luftfahrt als Trägerin der Gewalt und der Vernichtung, die zivile Luftfahrt als Sendbote der Zivilisation und der Völkerversöhnung werden die Zukunft beherrschen. Die Entwicklung jener wird mit ständiger Sorge, die Ausbreitung dieser mit frohen Hoffnungen begleitet.

" Ich glaube nicht, dass es möglich sein wird, die Entwicklung auf irgend einem der beiden Gebiete aufzuhalten. Ich bin aber überzeugt, dass die Zivilluftfahrt dem Antlitz der Erde tiefere Furchen eingraben wird als ihre bewaffnete Schwester."



From HIS EXCELLENCY GENERAL BALBO,
Italian Under-Secretary of State for Air.

" I progressi dell' aviazione non si discutono più.

" In venti anni di esperienze, l'aviazione ha dimostrato che le sue possibilità sono infinite. Il suo rapido sviluppo non trova riscontro nè in quello della navigazione marittima nè in quello della locomozione terrestre. Dai primi viaggi di Bleriot (14 km.) e di Farman (27 km.) siamo passati al volo transoceanico di Del Prete e Ferrarin e a quello transcontinentale di Costes e Bellonte che superano in realtà gli 8,000 km. La velocità di record si avvicina ai 600 Km. all 'ora ; nel mondo esistono oggi 90,000 miglia di linee aeree per posta e viaggiatori : qualche milione di uomini viaggia servendosi delle vie dell' aria. Tutto ciò se si tiene conto del brevissimo tempo intercorso è semplicemente meraviglioso.

" Non abbiamo ancora vinto l'Oceano ; ma il problema dell' Aviazione a lunga distanza viene attualmente affrontato dai tecnici e dagli aviatori con metodi molto meno empirici e avventurosi di due anni fa : non dubito che nei prossimi anni anche questo problema sarà risolto.

" I problemi aeronautici di oggi vengono affrontati con criteri di practicità e di utilizzazione che renderanno l'aeroplano un mezzo fra i più sicuri ; si costruiscono motori che resistono alle alte temperature, si fabbricano acciai speciali, il peso dei motori è ridotto ad un quarto di quello di dieci anni fa : dai motori di 40 cavalli siamo ai motori da 500 e da 1,000 cavalli che funzionano per centinaia di ore senza inconvenienti. Dagli apparecchi monomotori siamo passati ai plurimotori con 12 motori per 6,000 cavalli : l'ala viene utilizzata non solo come mezzo di sostentamento, ma anche per trasporto dei carichi. Nuovi dispositivi per neutralizzare gli effetti di errate manovre e per rendere il volo più sicuro e più facile, sono in continuo aumento. Ogni particolare dell' aeroplano è stato studiato in questi venti anni con tanta cura e minuziosità come non si è verificato ad esempio per le navi in 500 anni.

" Restano ancora da vincere la nebbia e l'oscurità. Ma anche questi due nemici dell' aviazione bengono ora attaccati di fronte con grande successo.

" Nei miei discorsi aeronautici ripeto spesso che non si possono fissare dei limiti all' avvenire dell' aviazione.

" Io credo profondamente che l'aeroplano modificherà la situazione attuale dei popoli migliorandone le condizioni e rendendo più rapido il cammino verso il benessere generale. Già oggi l'aeroplano viene applicato per una infinità di scopi : per l'agricoltura, per la scienza, per l'esplorazione di territori inaccessibili ecc. e persino per fini archeologici.

" Senza fare il profeta si può affermare che, camminando l'aviazione col ritmo odierno, fra altri venti anni il volto del mondo sarà completamente trasformato."

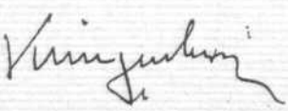
From ADMIRAL TAKARABE,
Minister of Marine, Imperial Japanese Navy.

" Celebrate 21st Birthday Special Issue of FLIGHT wishing more development and prosperity of the magazine."

From COLONEL KLINGENBERG,
Chief of Norwegian Military Aeronautics.

" Regarding the 21st anniversary of your highly esteemed journal, which I have read with great interest and profit for many years, on principle I am all for reading what other people write of interesting things, but am all against writing in public myself.

" My congratulations to the anniversary are just as heartfelt as if I had written you some hundreds of words."



Birthday Messages—*continued*

From DR. L. N. DECKERS,
Minister of Defence of the Netherlands.

" In the year 1911 the Dutch army for the first time employed reconnaissance aeroplanes during the army manœuvres. Two years afterwards the Air Force (Luchtvaartafdeeling) for the army and navy was organised, whereas in 1917 a separate air service was established for the navy.

" With the Dutch air service reconnaissance and observation are prominent, but, nevertheless, the fighting service excels in its extraordinary ability of its battle flights. That this is no exaggeration is proved by the fact that already in 1923, a flight got the first prize for flying in formation at Gothenburg, in Sweden.

" Individually the military airmen came also to the fore, either as pioneers in the flights to the Dutch East Indies, or in so far that they showed their mastership at international competitions, as, for instance, the Dutch officer who in 1927, at Zürich, was the leader at the international circuit flight in the Alps and performed this feat in the mountainous country of the Alps, which to him was absolutely unknown.

" The name of the military aerodrome at Soesterberg, with its excellent establishments, has become very significant in the world of international military flying.

" The air service of the Royal Navy has its centre in the Dutch East Indies. Besides a very large flying base at Soerabaia, the Navy has several minor bases. The training of airmen, however, takes place in Holland, at the aerodromes of the Helder.

" This year a flight of seaplanes belonging to the Royal Navy has travelled through the air from Holland to the Dutch East Indies. On the way it has been given very much assistance and support by foreign, and especially British, military authorities.

" The military and naval air services have given the impulse to the development of the civil air service in Holland and made it possible to the latter to get through the first difficult years by putting at its disposal able leaders and pilots.

" Taking everything together, the Dutch army and navy air services may be said to belong to the very best and to be a great credit to the name of ' Flying Dutchman.' "

From the Minister of Waterstaat in the Netherlands, MYNHEER O. REYMER
(Public Works and Communications).

" When remembering for a moment the result of attempts to rise above the earth the pioneers of aviation made some decades ago, when realizing the part that aviation for commercial purposes is already playing in the world's traffic, we are justified in anticipating that in a more or less distant future this new means of transport will be the equal in general use of railways and steamers.

" Wondrous are already the results of these new means of communication which, avoiding obstacles and being free of delays at the frontiers, carry their load from one end of the world to the other, shortening the time and the distances in a way which some years ago seemed scarcely possible.

" In the development of commercial air-navigation the Netherlands have their share embodied in the results of the national Company, the K.L.M. (Royal Dutch Airlines Company), which by its very good pilots, its safe and economic machines and its sound organisation takes one of the foremost places in the line of navigation companies of the world.

" Founded in 1919 ; beginning in 1920 in a modest way by establishing an airline between London and Amsterdam with the appreciated help of pilots and aeroplanes from the Aircraft Transport & Travel Co., London, the K.L.M. soon started and developed a number of airlines in Europe ; and now after only ten years finds its principal task in preparing and establishing an airline of great conception between the mother-country and the Netherlands East-Indies.

" This line will have not only an important commercial object, but also the ethical aim of bringing nearer to each other the inhabitants of the two parts of the Kingdom. The first series of experimental flights have proved a direct advantage by procuring a manner of quicker exchange of letters between the two countries.

" To fulfil this great task the world's nations must possess air-mindedness not only to induce them to employ the new means of transport in a large extent, but also to cultivate the sense of freedom of the air, necessary for the execution of such great enterprises.

" A sound and solid periodical as FLIGHT is, contributes to the progress of aviation by developing this greatly wanted air-mindedness. It is, therefore, that, congratulating the editors on the 21st birthday of their periodical, I express my best wishes for its prosperity, and I hope to be able to follow their work in length of years."

From COMMANDER AFONSO DE CERQUEIRA,
Chief of the Portuguese Naval Air Service.

" Aviation is one of the most important performances turned practical during the present century.

" In the way of transport of passengers as well as goods it is today the most speedy one.

" As a weapon of war it is the main and the indispensable support of the defence of a country.

" Portugal has been remarkable in aviation, through their well-known aviator's performances.

" I hope we will see the uninterrupted progress and development of aviation in Portugal.

" FLIGHT has very much contributed for the improvement and propaganda of aviation deserving the warmest praise from all who are interested in it."

Birthday Messages—*continued*

From GENERAL MOTTA,
Portuguese Minister of War.

" It is with the greatest pleasure that I submit, on the occasion of the 21st anniversary of FLIGHT my personal impression of the splendid effort made all over the world for the triumph of aviation.

" Aviation that was still a dream, some years ago is now a tremendous reality. Aviation faces humanity as Utopia realised. It is more than a discovery. It is a conquest whose far-reaching possibilities are growing every day and shall change unthinkably the slowly-increasing routine of actual communications between countries.

" Till now only land planes are beginning to be efficient. Men and post and freight travel at high speeds in relative but ever bettering conditions of security.

" Air lines are appearing everywhere, economy of time is spreading rapidly with immense benefit for commercial intercourse. But the oceans with their belts of fog and changing winds are still the great and terrible problems for aviation.

" The regular crossing of those huge spans of water shall be the finishing touch to the marvellous conquest of flight. But to attain it, great sacrifices shall still have to be made. Lives of great men of courage and splendid faith shall yet be risked in the doings.

" May I honour them and be proud of their efforts. In every way, they should be helped by the government of their countries.

" May I honour and be proud of the engineers, designers, manufacturers of the machines and engines, which slowly but surely are fighting their way to the ultimate success of commercial and regular trans-ocean flights.

" Sacrifices and risks shall yet be made and taken, but I think I may say—The thing is as good as it is done, the problem is as good as it is solved.

" May these words express my opinion about aviation in this moment, and be of interest to FLIGHT."

From COLONEL L. RAYSKI,
Chief of the Department of Aeronautics in Poland.

" Dès les temps les plus anciens l'instinct conquérant de l'homme le poussa à parcourir les mers, en quête de terres, de butin, d'aventures. . . Les barques des explorateurs, des pionniers et des commerçants se transformèrent avec le temps en bateaux, les bateaux—en vaisseaux—les vaisseaux devinrent des flotilles.

" En poursuivant la conquête des vivres, des perles et des esclaves, le génie et l'obstination de l'homme (et peutêtre tout simplement un heureux hasard) lui permirent de retirer la perle la plus précieuse : un Nouveau Monde.

" D'autre part, à mesure que, mû par le génie des mutuelles conquêtes, l'homme traversait les mers avec sa flotte commerciale—croissait aussi la résistance des peuples conquis. Il fallut poser des canons sur les vaisseaux de commerce—donner aux marins de la poudre et des armes.

" Encore quelques centaines d'années—et tous les peuples construisent des bâteaux deguerre, forment des flottes—terribles descendants de la barque timide, qui jadis aborda la première les rives des voisins inconuus—pleine de crainte, de curiosité et de désir. . . .

" Des siècles s'écoulèrent. Au milieu des lueurs des incendies et des éclats de tonnerre de la dernière guerre, qui embras a le monde presque entier, apparurent des volées d'oiseaux sanguinaires, portant, jour et nuit, la terreur, la mort et la destruction dans les camps et les capitales de l'ennemi.

" Créés par le génie de la pensée humaine et l'éternel instinct d'Icar, ces oiseaux devinrent cependant les outils du Démon, toujours affamé de sang. Telle est la malédiction des premières années de leur existence, des premiers essais de leur force et de leur bravoure.

" Mais les lueurs des incendies s'éteignirent et les volées des oiseaux humains ne cessent point de peupler la voûte des cieux—toujours plus grands, plus forts, plus sages, plus habiles et plus hardis. Ils s'essaient déjà à la lutte contre les deux puissances les plus inviolables—le Temps et l'Espace.

" Mais le moment approche où ils attaqueront une Puissance plus résistante que le temps et l'espace, plus élevée que les sommets des montagnes et plus largement répandue que l'océan l'inimitié entre les rations, l'illusion des frontières.

" Nous, Polonais, croyons, que l'histoire de l'aviation continuera au rebours celle de la navigation, et que le rôle, destiné à l'aviation dans l'histoire de l'humanité est celui d'un conquérant qui, bien qu'ayant commencé par la guerre—découvrira (inopinément,-peut-être sciemment—grace à son génie où à une coïncidence propice) le pays le plus digne de recherches : le Monde de la Paix."

From HIS ROYAL HIGHNESS PRINCE PURACHATRA,
Minister of Commerce and Communications of Siam.

" An Air Service was established in Siam seventeen years ago. Since then Siam's chief aerodrome has been used regularly on long-distance flights. An aerial postal service was established over the Eastern Provinces in 1922 with continuous success. Further developments are under consideration to assist international air communications. I wish all success to your efforts to advance the cause of aviation.

Birthday Messages—*continued*

From GENERAL A. GORSKY,
Inspector-General of Aeronautics, Rumania.

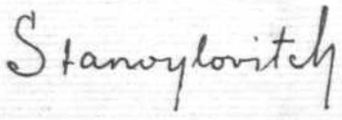
" The twenty-first anniversary of the well-known periodical FLIGHT is an unusual event, for it constitutes a reminder of creative activity and of the help given by this periodical to the first efforts of world in general aviation and to those of the splendid British aviation in especial.
" The penetration of civilisation to the obscure corners of the earth, the raising of humanity towards new and beneficial goals, the appreciation and admiration of the cosmic medium of the earth through the domination of the air constitute programmes to be realised in the future.
" Only he who rises up in the air can see how small life on the earth is and how the genius of man is triumphant in the air, in spite of his small stature.
" In the air he can comprehend the greatness of creation which raises man towards perfection.
" Every nation is destined to bring the weight of its genius to this *struggle for new life*, and the secret of future progress depends upon the means by which it will know how to adapt itself to the new conditions of existence.
" The English people forerunners in the greatest historical developments have identified themselves with the genius of conquest the air *they have made use of this conquest for the strengthening of relations with the Dominions, thereby facilitating their traditional dominion over the most complicated Empire that the world has ever known.*
" The Roumanian nation, through its geographical position and its historical past, is destined to find itself in the path of the great aerial lines of Europe. If the Roumanian people in the past was in the destructive path of the barbarian invasion from the East, in the future it looks forward impatiently to receiving the light that will come by air from the West to radiate its sphere of action.
" The Roumanian atmosphere will be the object of general admiration because of its extraordinary clearness at the crossing of the great aerial ways of Europe.
" As the Danube casts into the sea through the Roumanian Delta the waters gathered from the centre of Europe, so here in Roumania the principal aerial stage of Europe will halt before passing into the immensity of Soviet territory, with its enigmas and mysticism.
" I foresee that the future of aviation will have an overwhelming influence for the good and progress of humanity, for it will utilise with great benefit the providential gifts of nature. Future generations will live in a new epoch of legendary realisations which the youth of this passing generation dreamt of, this generation which contributed to the first steps in aviation with enormous sacrifices."

From COLONEL FIERZ,
Chief of Swiss Aeronautics.

" Nous souhaitons à votre journal un avenir prospère et vous présentons Messieurs, l'expression de nos sentiments distingués.

From GENERAL STANVYLOVITCH,
Chief of Aeronautics in Yugoslavia.

" Le vingtième siècle qui a vu naitre le vol mécanique et l'Aviation restera mémorable dans l'histoire du Monde d'avoir donné à l'Humanité un moyen nouveau pour vaincre l'espace et le temps, duex grands obstacles de l'activité humaine.
" J'éstime que ce mérite ne fera que grandir aux cours des années qui vont suivre et que l' Aviation, aujourd' hui encore limitée aux rôles auxiliaires de cette activité humaine, deviendra une nécessité pour les hommes de demain.
" Cette nécessité, nous la ressentons déjà partout, où les autres moyens de locomotion de permettent pas à l'homme de réaliser ses intentions avec la rapidité de développement de ses besoins.
" L'Aviation au service de la locomotion aérienne et de la défense nationale a déja acquis sa place.
" L'étendue de son utilisation, encore limitée par les considérations de coût, fonctionnement délicat des moteurs et par l'insuffisance de moyens techniques pour la maitrise des éléments de la nature, augmentera au fur et à mésure des perfectionnements qui seront provoqués justement par les imperfections actuelles, aussi bien dans le domaine de groupes motopropulseurs que dans celui de moyens de cóntrole de la navigation et de la securité.
" Ce que l'on peut certainement attendre dans un proche avenir c'est la securité du vol mécanique et la capacité d'utilisation des aéronefs bien plus grandes qu'aujourd' hui.
" J'ose croire et même éxprimer ma pensée au sujet du rôle de l'Aviation dans un avenir pas très lointain : le sort des nations est aux ailes.
" Plus loin encore dans l'avenir on pourra oser dire que c'est par les ailes plus que par tout outre moyen que l'on aura la paix et la disparition des guerres entre les peuples.
" C'est alors que l'Aviation prendra la place d'honneur, avec le vrai mérité, parmi les plus belles et les plus grandes créations du génie humain.
" Esperons et travaillons ! "



Birthday Messages—*continued*

From REAR-ADMIRAL W. A. MOFFETT,
Chief of the Bureau of Aeronautics, Navy Department, U.S.A.

"Heartiest congratulations on 21 helpful years in further advancing the science of aeronautics."

From MAJ.-GENERAL JAMES E. FECHÉT,
Chief of the Air Corps, War Department, U.S.A.

"Heartiest congratulations on your twenty-first birthday. May you enjoy many more to continue your splendid work."

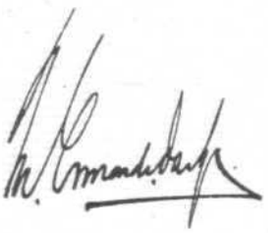
From MR. CLARENCE YOUNG,
Assistant Secretary for Aeronautics, Department of Commerce, U.S.A.

"Congratulations on your constructive contributions to aviation during 21 years. May they continue indefinitely."

◈ ◈ ◈ ◈

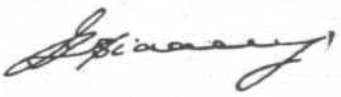
From LIEUTENANT-COLONEL M. ORMONDE DARBY, O.B.E.,
Joint Managing Director with Lieut.-Col. J. Barrett-Lennard of A.D.C. Aircraft, Ltd.

"Please accept my heartiest congratulations on your twenty-first anniversary. On my many trips abroad I found that FLIGHT is as greatly looked forward to as it is at home—Surely an International tribute."



From MR. J. D. SIDDELEY, C.B.E., F.R.Ae.S.,
Chief of the Armstrong-Siddeley,
Armstrong Whitworth and
Avro Companies.

"I am glad to learn that FLIGHT will have completed the 21st year of its publication on the 3rd of January, 1930.
"During the whole of that period your journal has been conducted in a dignified manner, and has always endeavoured to assist the British aircraft industry.
"With all good wishes for the future."

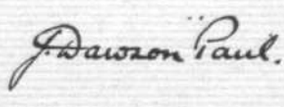


From MR. ROBERT BLACKBURN, O.B.E., F.R.Ae.S.,
Managing Director of the Blackburn Aeroplane and Motor Co., Ltd.

"The completion of 21 years of publication of Aviation affairs is an achievement which reflects great credit on FLIGHT's founder and Editor, and his staff, and I have great pleasure in offering all concerned my very hearty congratulations. I well recall its first issue, which incidentally, coincided with the beginning of my own activities in aircraft design and construction. Since then the whole aspect of Aviation has undergone drastic changes. Throughout these changes FLIGHT, the first aircraft weekly magazine in the world, has always kept abreast of the times, and, I venture to believe, has maintained its position as one of the foremost publications of its class in the world. I have ever looked upon it as an excellent medium for obtaining information on the advancement of the world's aircraft in general, and I shall look forward to the time when it will be reporting the movements of flying ships of the great commercial concerns throughout the world. FLIGHT has my very best wishes for a long and prosperous career."

From CAPTAIN J. DAWSON PAUL,
Chairman of Boulton and Paul, Ltd.

"Compared to yourself, Boulton and Paul, Ltd., are relative new-comers into the aircraft business, and it is with some diffidence, therefore, that I offer to so senior an enterprise as FLIGHT the heartiest possible congratulations on the attainment of its 21st birthday.
"During the whole of the period of this Company's connection with the aircraft industry FLIGHT has always shown a most intelligent appreciation of that industry's peculiar difficulties. Its policy is invariably well considered, and its criticisms invariably constructive, and, in common, I feel sure, with all my fellow members of the aircraft industry, I look forward with confidence to the continued success of your excellent paper."



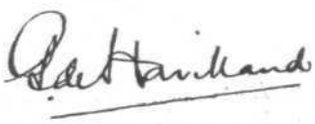
Birthday Messages—*continued*

From MR. JUAN DE LA CIERVA,
Director of the Cierva Autogiro Co., Ltd.

" I should like to congratulate you on the attainment of the 21st birthday of FLIGHT, and on the enormous growth and flourishing condition of this paper. There is no doubt that aviation, not only in the Kingdom, but throughout the whole world, has benefited greatly from the influence of your publication and by the interest which you have inspired."

From CAPTAIN GEOFFREY DE HAVILLAND, O.B.E., A.F.C.,
Technical Director of the De Havilland Aircraft Co., Ltd.

" Best congratulations on FLIGHT's 21st birthday. FLIGHT set a high standard in Technical Journalism, which it has always maintained. I have been a regular reader from No. 1, Volume I, onwards, and hope to continue to read FLIGHT for many years to come."



From MR. A. M. DESOUTTER,
Managing Director of the Desoutter Aircraft Co., Ltd.

" 21 years of flying ! What a long time this seems to those early enthusiasts who made aviation possible, and what happy memories it brings of the early days of flying at Hendon and Brooklands. I am glad to be able to offer you and all your staff my very best wishes on FLIGHT's attainment of its 21st birthday."

From MR. C. R. FAIREY, M.B.E., F.R.Ae.S.,
Managing Director of the Fairey Aviation Co., Ltd.

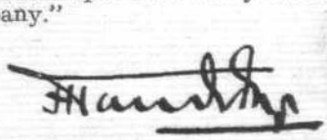
" Will you permit one who has taken FLIGHT from the very first number to the present time to congratulate your paper on reaching its 21st anniversary ?
" We are always hearing that aviation is in its infancy, and the fact that its oldest paper is only just coming of age brings the fact home to us.
" We who have appreciated FLIGHT's high technical standard and unbiased commentary would add to our congratulations our best wishes for a long and prosperous career."

From MR. DAVID LONGDEN,
Managing Director of the Gloster Aircraft Co., Ltd.

" I desire to extend to you and all your staff our very cordial congratulations on the 21st birthday of your esteemed journal.
" We at Gloster have always appreciated the support you have given to the British Aircraft Industry in the pages of FLIGHT, and particularly the quality of that support, which I am sure is of material assistance to the industry in the marketing of its products.
" We welcome this occasion to wish you every success in your enterprise, and we trust that the prosperity of the British Aircraft Industry may be such as to allow us the pleasure of giving you a greater measure of well-merited support in the future."

From MR. F. HANDLEY PAGE, C.B.E., F.R.Ae.S.,
Managing Director of Handley Page, Ltd.

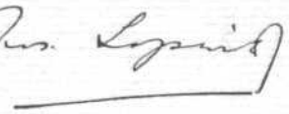
" The time has passed so rapidly since FLIGHT was first published that it seems almost incredible to believe that it is now about to complete its twenty-first year of publication.
" The attainment of manhood by an individual is always an important event in his life, and in the present instance, completion of twenty-one years of publication marks an epoque in the development of aviation, for FLIGHT has, during this period, been able to record the growth of an industry from the experimental aircraft constructed by enthusiasts to a world-wide activity, inclusive of transport undertakings that fill an entirely new field for the quick transport of passengers, goods and mail.
" I take particular interest in the fact that FLIGHT will attain its majority this year, for on June 17 of this year also—1930—Handley-Page, Limited, will celebrate the twenty-first anniversary of its registration as a limited company, it having been registered on June 17, 1909.
" I have not the slightest doubt that in the coming years FLIGHT will continue to maintain the same high standard of publication and interest to its readers that has made it so attractive to everyone connected with aviation in the past, and express the hope that we may live to celebrate the fiftieth anniversary of both FLIGHT and our company."



Birthday Messages—*continued*

From MR. T. O. M. SOPWITH, C.B.E., F.R.Ae.S.,
Joint Managing Director (with Mr. F. Sigrist) of the
H. G. Hawker Engineering Co., Ltd.

"Hearty congratulations on your 21st birthday, and best wishes for a long and prosperous future to continue your good work in the cause of aviation."



From MR. F. SIGRIST, F.R.Ae.S.,
Joint Managing Director with Mr. Sopwith of the H. G. Hawker Engineering Co., Ltd.

"Congratulations on attaining your majority. I hope that the future will see as great an extension in your activities as the past."

From SIR ALLIOTT V. ROE, O.B.E., F.R.Ae.S.,
Joint Managing Director with Mr. John Lord of
Saunders-Roe, Ltd., and one of the pioneers of British Aviation.

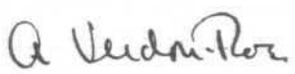
"How well I remember my visits to the "Auto" offices in St. Martin's Lane, and Mr. Stanley Spooner's cheery smile when I used to tell him about my experiments with model aeroplanes, as the "Auto" used to devote some of its space to aeronautical matters.

"It was a real pleasure and an inspiration to talk with Mr. Spooner, as he took such a great interest in those pioneer efforts.

"This was before the birth of FLIGHT, and therefore it was not a matter for surprise when it was decided to produce a weekly paper solely devoted to aeronautical affairs

"It has been a great source of pleasure to see FLIGHT hold the high position it does in the world of weekly aviation papers. Mr. Spooner has the support of a keen and loyal staff, and those interested in aviation can rest assured that FLIGHT will always be trying to improve its already most interesting and instructive paper."

"I heartily congratulate all concerned on the success of their past achievements."

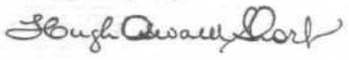


From MR. H. OSWALD SHORT, F.R.Ae.S.,
Managing Director of Short Brothers.

"Many congratulations to yourself and staff on the occasion of the 21st birthday of FLIGHT.

"The period covered from the date of your first issue up to the present time covers also the complete history of practical achievement in aerodynamic flight in Great Britain, and renders your Journal a real pioneer amongst the Aeronautical journals of the world.

"All your readers will wish FLIGHT a long and successful existence to fight, as it always has done in the best traditional manner of British journalism, for the advancement of aviation generally."



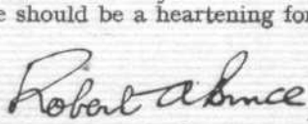
From O. E. SIMMONDS, A.F.R.Ae.S.,
Chairman and Managing Director of Simmonds Aircraft, Ltd.

"It affords me the greatest pleasure to be able to congratulate FLIGHT and its indefatigable founder and editor, Mr. Stanley Spooner, who, to their widely recognised maturity of judgment, have now added the maturity of years. It was once said of a certain journal, not aeronautical, that the items which were not interesting were not true, and those which were true were not interesting. Of FLIGHT the very reverse may be affirmed, for with an accuracy which is almost proverbial amongst those who fly and make to fly, it has combined a style at once lucid and attractive. To FLIGHT also is the credit for strong and successful advocacy of many a worthy cause which might otherwise have drifted hopelessly in the flat calm of technical conservatism or foundered in the seas of political antagonism.

"To-day I know of no greater service that FLIGHT can render to British aviation and to the Empire than to give of its best to the cause of the large flying boat—a craft so essential to our Imperial position—a craft which timidity alone is keeping from us. It is with the utmost relief that I have recently perceived the entry of FLIGHT into the fray; so yet again, my thanks and my congratulations!"

From MR. R. A. BRUCE, O.B.E., M.I.M.E., M.Inst.C.E.,
Managing Director of Westland Aircraft Works.

"Congratulations on your work for aviation in the past, and best wishes for your success in the future. The healthy growth of the infant during adolescence should be a heartening forecast of vigorous maturity."



Birthday Messages—*continued*

From MR. T. A. DENNIS,
Managing Director of A.B.C. Motors, Ltd.

"It is with great pleasure that we send to FLIGHT our heartiest congratulations on the attainment of its 21st anniversary. Looking back over the years since its first issue, one realises the tremendous value its scientific contributions and publicity work have been to the progress of aeronautics, and it is impossible to over-estimate the important part the publication has played in bringing about the present rapid development of British aviation.

"May we also extend our congratulations to the Editorial, Technical and Publicity Staffs, who by their united effort, loyalty and courtesy have made FLIGHT the popular and successful publication it is."

T. A. Dennis.

From MR. A. H. R. FEDDEN, F.R.Ae.S.,
Chief Engineer and Designer of the "Bristol" Aero Engine Department.

"Just a line to wish you very many happy returns of the day on the occasion of the twenty-first birthday of FLIGHT. No matter what part of the world you go to on aviation business you are sure to see in almost every office the familiar grey cover of FLIGHT. The good illustrations and restrained comments on technical matters are much appreciated."

A. H. R. Fedden

From MAJOR J. STEWART, O.B.E.,
Joint General Manager, Cirrus Aero-Engines, Ltd.

"FLIGHT, which with proper pride entitles itself the 'First Aero Weekly in the World,' is to be congratulated on attaining its 21st birthday.

"It may truly be said that FLIGHT has fostered aviation without fear or favour, and that it has continually voiced an informed, yet constructive, criticism, which has been at once a stimulus and an inspiration to those in the aircraft and aero engine industry.

"FLIGHT has devoted 21 years to the service of British Aviation, and for that it deserves our admiration and gratitude."

J. Stewart.

From MR. H. T. VANE, C.B.E.,
Managing Director of D. Napier & Son, Ltd.

"Many congratulations on the coming of age of FLIGHT.

"To have watched and helped the progress of a new industry from its infancy to its present position, to have described the great advances made in design and performance, must be a source of gratification to you, whose faith in the future of aircraft has never faltered.

"May you continue to prosper and be as helpful to British aviation in the future as you have been in the past."

H. T. Vane

From MR. A. F. SIDGREAVES, O.B.E.,
Managing Director of Rolls-Royce, Ltd.

"On the anniversary of the twenty-first birthday of FLIGHT, I should like to offer you my cordial congratulations.

"In your first issue you clearly stated your chief aims and objects, and I am sure it is recognised that you have well succeeded in your admirable efforts and that your assistance has been of real and substantial value to the industry.

"To have started in 1909 a journal solely confined to aeronautical matters showed great foresight, courage and confidence which have been fully justified as, if one looks back to Wilbur Wright's flight on December 28, 1908, when he flew a distance of 99·9 km. in 1 hr. 54 mins. 53 secs., during which he reached a speed of 60 km. per hour (then establishing a record), and compares that performance with the recent flight of Sqdn.-Ldr. Orlebar, who attained a speed of 575·700 km. per hour, one realises the enormous progress that has been made in aviation since the issue of the first number of FLIGHT.

"I wish your journal every success, and trust that you, personally, may be spared to continue for many years to come the good work you are carrying on."

From MAJOR FRANK B. HALFORD, F.R.Ae.S.,
Designer of "B.H.P.," "Cirrus" and "Gipsy" Engines, etc.

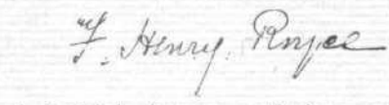
"May I take this opportunity to wish FLIGHT very many happy returns of the day. You may well look back on the past twenty-one years with satisfaction. To those of us who have 'lived' aviation from its earliest days, FLIGHT has always been something to look forward to. It has always been sober and sound, and in these days of sensational journalism, it is a great deal to be thankful for. I hope for very many years to come to enjoy FLIGHT's pages. One also cannot help being impressed by the fairness of its Editorials."

Frank B. Halford

Birthday Messages—*continued*

From MR. F. H. ROYCE, O.B.E,
of Rolls-Royce, Ltd.

" Congratulations on a life through a wonderful period of from 'small things to great.' May you continue to prosper and have equally interesting progress to report."



From the RT. HON.
SIR ERIC GEDDES, G.C.B., G.B.E.,
Chairman of Imperial Airways Ltd.

" I should like to congratulate those who with foresight and, I think, intense optimism, not only commenced to publish FLIGHT twenty-one years ago, but continued to do so through many lean years.

" During its minority years FLIGHT has seen aircraft develop from box-kites to air liners and it has acted as a medium for the co-ordination and exchange of ideas and thoughts of designers, constructors and operators.

" To-day, when the need for constant progress is of the greatest importance, we in Civil Aviation look upon this interchange of thoughts as one of the most valuable functions of your paper. On my own behalf and also on behalf of Imperial Airways, I wish you continued success."

From COL. THE MASTER OF SEMPILL, A.F.C,
President of the Royal Aeronautical Society.

" The Royal Aeronautical Society, now completing its sixty-fourth year, considers it a privilege to offer warm congratulations to FLIGHT—the oldest regular weekly aeronautical publication in the world—on its coming-of-age. Since the first issue the proceedings of the Society have been given considerable and increasing prominence in its pages—may it be said to the lasting benefit of both ?

" The Founder and Editor, who is incidentally a Founder-Member of the Society, has for close on thirty years devoted his energies unremittingly to the cause of aeronautics, and has fulfilled his self-imposed task with efficiency and tact. In the first issue the Editor asked ' whether the title which has been selected for this journal will be thought well chosen in a few years to come, when flying is indeed an everyday accomplishment ? ' It is obvious that the answer is in the affirmative, and the Editor may well be congratulated on the breadth of his conception of aerial transport.

" FLIGHT first saw the light of day when those who had piloted power-driven heavier-than-air machines could be numbered on the fingers of one's hands. Among these pioneers one of the most prominent—now a Vice-President of the Society—in a letter published in the first issue, referred to the almost hostile attitude of the British public : ' so ready to discourage one, ridicule one and look upon one as an amiable lunatic.' He was, however, in very good company, and, with other intrepid pioneers of our own and other countries, in recent years received the recognition to which they were so justly entitled. For this they owe much to the efforts of FLIGHT.

" This coming-of-age falls at a very appropriate time, as within the past year we have celebrated the 25th Anniversary of the first flight made by man in a power-driven heavier-than-air machine, and the 20th Anniversary of the first cross-Channel flight which challenged the age-long dominion of the sea.

" Technical progress to-day may in some measure be judged by the fact that the World Speed Record now stands at over 360 m.p.h., and that two airships of 5,000,000 cubic feet capacity have successfully completed preliminary trials. These achievements are ' all-British,' and we may be justly proud of them, but should only allow this pride to spur us on to further and greater efforts.

" That FLIGHT will grow from strength to strength is clearly indicated by the results of past efforts. May all success attend the Editor and his staff, many of whom have served with him since the first issue. This is the sincere wish of that ever-increasing number who believe in the immense future of aeronautics."

From THE ROYAL AERO CLUB,
via its Chairman, SIR PHILIP SASSOON.

" On this, the 21st anniversary of the day when you had the courage to support your belief in the future of flying, by launching the valuable enterprise FLIGHT, I have much pleasure in expressing to you the Club's congratulations, both on your foresight, the success which has attended your venture, and the great assistance which it has been to the cause that we all have at heart. We wish both FLIGHT and its moving spirit many years of prosperity."

From LIEUT.-COMMANDER H. E. PERRIN,
Secretary of the Royal Aero Club of Great Britain.

" It has been the greatest pleasure to the Club and myself to have been associated with you during the whole of this period of 21 years, and long may this association continue.

" This event brings to my mind the fact that I quite overlooked my 21st anniversary as Secretary of the Club, and I believe I have also passed the 25th. I expect I shall have to wait until the 50th."

Birthday Messages—*continued*

From DR. GERALD MERTON, M.C.,
Chairman of Executive Committee, Air League of the British Empire.

"It is a particular pleasure to the Air League of the British Empire to have this opportunity of sending a message of congratulation to Mr. Stanley Spooner, Editor and Founder of that admirable magazine, FLIGHT, and to his colleagues who are celebrating on January 3, the twenty-first birthday of this the oldest weekly aeronautical publication in the world.

"As Chairman of the Air League I wish to convey not only my own felicitations, but those of my colleagues on the Executive Committee of the League who are gratefully appreciative of the many kind favours extended to us by FLIGHT in the way of information, the use of photographs, etc., in the pages of the old Air League Bulletin as well as in the monthly magazine, *Air*.

"Mr. Stanley Spooner was a man of vision two decades ago. People of similar farseeing qualities founded the Air League in the same year that FLIGHT made its appearance. The Air League is, in fact, but three months junior to Mr. Spooner's publication.

"We rejoice, therefore, in the celebration of two anniversaries and extend to Mr. Spooner heartfelt congratulations and grateful thanks for his splendid work on behalf of British aviation, wishing him many years of continued service in this great cause."

Gerald Merton

From LIEUT.-COL. I. A. E. EDWARDS, C.M.G.
Managing Director of National Flying Services, Ltd.

"It is with the greatest pleasure that I send you my heartiest greetings and good wishes on the coming of age of FLIGHT.

"The pioneering spirit which induced your founders to start their venture has been repaid in the fullest measure, for there can be few who are today connected with aviation who are not your regular readers and who have not profited vastly from the fund of information with which you have provided them.

"Can I say more than that I always look forward to the issue of the paper.

"Wishing you ever-increasing prosperity in the years to come."

I W Edwards

From LIEUT.-COL. J. T. C. MOORE-BRABAZON,
Holder of No. 1 Certificate, Royal Aero Club of the United Kingdom.

"We have seen many great changes and inventions take place in the world during the last 100 years, but perhaps the most astounding has been the conquest of the air by man. A thing looked upon as impossible, even with proverbs made about it, has yet been made possible, and there will be found in your columns week by week for the last 21 years the accounts of the progress man has made, his triumphs and his failures.

"No romance from the most imaginative brains will ever equal the story told in these volumes of FLIGHT, and although there is much to be done and the second stage is commencing, it can never be what these first volumes are—that is, a 'fairy story.'

"How many we wish might have been here with us to join in congratulations at the position the movement occupies in the world to-day, had they not fallen by the wayside.

"To have conducted a paper all this time redounds to the credit of the editorial staff. FLIGHT has always been interesting, alive, and dignified. We have much to be proud of in the aeronautical press of this country, and consequently, from the bottom of my heart I offer congratulations to your paper and to my old friend, Mr. Spooner, and hope that those who fought the battles of this movement on the press side will reap the reward that they so richly deserve."

J T C Moore-Brabazon

From SIR EDWARD M. ILIFFE, C.B.E., M.P.

"Heartiest congratulations to FLIGHT upon the attainment of its 21st anniversary, and to its founder, my friend Stanley Spooner, upon his wonderful foresight and confidence in the future of aviation. It must have been a very uphill fight in the early days. Only pioneers can appreciate the disappointments and set-backs attendant upon establishing a journal devoted to a new industry. FLIGHT has remained steadfast in its beliefs, and to-day can reflect with satisfaction upon the invaluable spade work it has performed in the national interest.

"Historians will record the mechanical transport movement as the greatest revolution of the twentieth century; flying has played an extremely important part in this progress. But for pioneer effort such as that of Mr. Spooner with his journal FLIGHT and its encouraging and inspiring treatment of aerial achievement, this country might have lagged behind. To-day, with an important aircraft industry firmly established, we have a national asset of first importance, and in the next 21 years thousands will share in the prosperity built up from small beginnings and the unswerving confidence of those who sponsored the movement. If Sir Charles Wakefield can be termed the patron saint of aviation, Mr. Stanley Spooner must be ascribed not only as its heralding angel, but its mentor and guiding star."

Edward M. Iliffe

Birthday Messages—*continued*

From SIR CHARLES C. WAKEFIELD, Bart., C.B.E. (now Lord Wakefield).

" I am very glad to offer my congratulations to FLIGHT upon its coming-of-age. This is an achievement of unusual interest in that FLIGHT has been a pioneer amongst weekly journals devoted to aeronautics. Under distinguished Editorship, it has through all its twenty-one years encouraged and recorded the development of British Aviation. It has had during that eventful period an astonishing and an inspiring story to tell, for the progress of aviation from the experimental stage to its present position as a vital factor in modern life has been truly wonderful. The dreams of the pioneers, their daring and their brilliant technical research and practical demonstration, have all been reflected week by week in the pages of FLIGHT, so that a history of FLIGHT is also in large measure a history of aviation.

" Whatever the next twenty-one years bring forth in air mastery (and we may be very certain that tremendous changes in our habits of life will be brought about by the continued development of aviation), I trust that FLIGHT will continue the story in its pages with its customary goodwill and impartiality."

From SIGNOR G. CAPRONI.

The famous Italian pioneer aircraft constructor.

" Sono lettore assiduo di FLIGHT fino dalla sua origine.

" In questa bella rivista ho sempre trovato tutto ciô che si è fatto di interessante, tutte le più importanti notizie, nel campo areonautico. Con vivo piacere ne sô festeggiato il ventunesimo anno, e sono ben felice di associarmi in questa occasione alla gioia dei suoi amici.

" Sfogliando le annate di FLIGHT rivedo i modesti inizi dell' aviazione, la fiamma dei suoi pionieri, costruttori, piloti. propagandisti, in mezzo alla incredulità ostile del mondo ufficiale.

" Rivedo i suoi primi passi, il suo rapidissimo sviluppo, il suo trionfale affermarsi. A noi stessi, che dei successi siamo stati attori e partecipi, sembra quasi di leggere non i fatti della nostra vita, ma quelli di epoche l'ontane, vecchie storie ormai perdute nel tempo.

" Quello che una volta sembrava impossibile, oggi è realtà già sorpassata ; i problemi un tempo giudicati insolubili, costituiscono oggi l'elemento fondamentale dell 'areonautica, passata dall'empirismo alla scienza.

" Le velocità limiti sono state sorpassate.

" Le altezze irraggiungibili sono state vinte.

" Come vent'anni fa solo pochi veggenti credettero all' aviazione di oggi, così solo chi ha fede sicura sa prevedere quello che essa sarà in un vicino domani.

" All'inizio poche decine di entusiasti, con i mezzi più limitati, ebbero il coraggio di ardire e di operare ; oggi in tutto il mondo migliaia di tecnini si affaticano intorno ai problemi dell' areonautica, e centinaia di migliaia di operai ne realizzano le concezioni.

" Il progresso dell' areonautica avvenire si rispecchia nel suo recente passato : esso sarà rapido e supererà tutte le più audaci attese."

From DR. HUGO JUNKERS,

The famous German aircraft constructor.

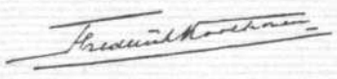
" Zum einundzwanzigjaehrigen bestehen ihrer zeitschrift die sich in den fuer die entwickelung der luftfahrt so bedeutsamen letzten jahrzehnten fuer den wissenschaftlich technischen fortschritt der luftfahrt stets voll eingesetzt hat beste glueckwuensche."

From MR. FREDERICK KOOLHOVEN, F.R.Ae.S.,

Late Chief Designer to the Armstrong-Whitworth Company, later to the B.A.T. Company, and now head of his own firm at Rotterdam.

" May I sincerely congratulate FLIGHT and its staff on the ' coming of age ' of your paper.

" We old timers all know how much FLIGHT has done for the progress of aviation during a very difficult period and it must be a great satisfaction to you to know yourself to be one of the real pioneers and to see your work crowned in the ever-continuing growth of FLIGHT."



From MR. GLENN L. MARTIN,

Chairman of the Glenn L. Martin Co., and one of America's pioneers

" The Glenn L. Martin Company had its beginning in 1909, and we feel extremely gratified in congratulating you on your twenty-first birthday as the world's first aeronautical weekly, and a paper that has always been of the greatest value to aeronautics."

Birthday Messages—*continued*

From MR. ORVILLE WRIGHT,
America's pioneer in aviation and surviving brother of Wilbur Wright.

"On its 21st anniversary, I send congratulations to FLIGHT in recognition of its twenty-one years of useful service to aeronautics. I wish it continued success."

From MR. GLENN CURTISS,
The famous American pioneer aircraft constructor.

"Cordial best wishes on your 21st birthday. May the official organ of the Royal Aero Club enjoy a full measure of gratification on its past brilliant record, and go forward to even greater accomplishments in the future development of aviation."

SOME LATE MESSAGES

From REAR-ADMIRAL AUGUSTO LOAYZA,
Minister of Marine and Aviation, Lima, Peru.

"It is evident that the same is taking place in the world today in aviation that took place thirty years ago with the automobile. There can be no doubt that the day is soon to arrive when the most common and most preferred way of travel will be by the air.

"In no country in the world is this progress more evident than in Peru and in no country is it more beneficial. It is a country whose geographical structure makes it almost impossible to economically construct highways or railroads, and a country, on account of which natural obstacles, has for years been one of the most difficult countries for travel in the world. Within the last three years, commercial aviation has been established on a sound basis, and today we see the traffic by air increasing in leaps and bounds. From 78 passengers carried by commercial lines in June of this year, this number has increased to 400 in October and indications are that the number of passengers carried in November will arrive at 600. It must be remembered, in contemplating this point, that the population of all Peru is much less than the city of London.

"Another noteworthy phase in connection with the rapid development of aviation throughout the world is the tremendous influence which it has exerted in bringing about world peace. It is the opinion of the undersigned that aviation has, by its very existence, contributed as much towards the general tendency on the part of nations towards world peace, as have diplomatic or any other possible negotiations.

"Aviation has arrived, and its future is not as an arm of war, but as an instrument of peace and mutual understanding among the nations on the face of the globe."

From WING COMMANDER L. S. BREADNER, D.S.C.,
Director of the Royal Canadian Air Force.

"The Director and Officers of the Royal Canadian Air Force congratulate FLIGHT on its 21st birthday and anticipate its continued success."

From SIR G. STANLEY WHITE, Bart.,
Managing Director of the Bristol Aeroplane Co., Ltd.

"Sincere congratulations on the 21st birthday of FLIGHT. These 21 years have seen a wonderful transformation in the aeroplane and practical aviation, and I feel sure that FLIGHT has played its part in extending and maintaining the public interest and in recording the constant development of the aeroplane as a practical means of locomotion.

"The 'Bristol' Co. has not long to wait before celebrating its own 21st anniversary, and I trust we may have FLIGHT as an ally to record our successes for many years to come, as it has done in the past."

From MR. F. W. LANCHESTER,
Author of "Aerodynamics" and "Aerodonetics," and a pioneer in aerodynamic science.

"Hearty congratulations to FLIGHT on achievement of 21 years' service in the best interests of aeronautics. Much regret unable to be present at FLIGHT dinner."

From JOHN JAY IDE,
Technical Assistant in Europe, American National Advisory Committee for Aeronautics.

"As an admirer of FLIGHT since its inception I desire to express my congratulations on its coming of age and send best wishes for its continued prosperity."

From DR. ING. ERNST HEINKEL,
Head of the Heinkel Flugzeugwerke of Warnemünde, and one of Germany's Pioneer Aircraft Constructors.

"Zu Ihrem 21-jährigen Bestehen übermittele ich Ihnen meine besten Wünsche und gebe der Hoffnung Ausdruck, dass es Ihnen auch in späterer Zeit mit viel Glück vergönnt sein möge, an der Entwicklung der Weltluftfahrt mitzuarbeiten.

"Mit grossem Interesse habe ich seit Anbeginn meiner Tätigkeit Ihre Zeitschrift gelesen und ihr manche wertvolle Anregung entnommen.

"Meine besten Wünsche begleiten Sie."

TWENTY-ONE YEARS' PROGRESS IN AERODYNAMIC SCIENCE

By LEONARD BAIRSTOW, C.B.E., F.R.S., F.R.Ae.S.

Professor Bairstow is Zaharoff Professor in Aerodynamics at London University, and Head of the School of Aeronautics at South Kensington. For very many years he has been regarded as the leading British authority on aerodynamic questions, and we are very gratified that Professor Bairstow has done us the honour to write an article specially for the Birthday Number of FLIGHT.

THE first issue of FLIGHT in January, 1909, appeared as aviation emerged from the dreams of ages into accomplishment but before the pioneer stage of flying was ended. The European flights of the Wright Bros. were recent and Britain was awakening to an interest which had been dormant since the trials of the giant Maxim aeroplane. Perhaps it would be most fair and correct to attribute the dawn of aerodynamic science to a period some twenty years before 1909. In this country Maxim had made numerous experiments with airscrews and planes—really flat surfaces—and had correctly deduced the horse-power necessary for flight. Engines then were driven by steam and in a wonderful effort Maxim produced a steam-engine capable of lifting 10,000 lbs. but weighing only about half-a-pound for each of its 360 h.p. The lift was actually achieved on a captive craft, but structural failure ended a fascinating and daring experiment.

In America, Langley pursued an independent line of scientific aerodynamic enquiry. Using a whirling arm in the open which gave a lot of trouble owing to winds he devised experiments which lead to the construction and demonstration in flight of very successful models. Again, the motive power was steam. When FLIGHT first made its appearance "Langley's Law," that high aspect ratio—or as it was then put, large amount of leading-edge, was an asset which had become controversial. The controversy led to arguments as to the relative aerodynamic merits of monoplanes and biplanes, Bleriot being the leader of the monoplane group and Farman one of the protagonists in favour of the biplane.

An improvement in wing form had been found by Lilienthal; he showed that curved surfaces were more efficient than flat ones in producing lift for a given resistance. The study of birds' wings probably suggested the idea; the evidence of bird study will be found written all over the writings of 20 to 25 years ago. The load carried per square foot of surface was low—some three pounds in 1909 in the Farman biplane—and the speed of flight was correspondingly low—35 m.p.h. One of the consequences was that aeroplanes were tossed about like shuttlecocks in a breeze. Moreover, flying took place just over the housetops and little opportunity occurred for dealing with the now well-known consequences of stalling.

The first great jump forward in the application of scientific aerodynamic enquiry came from a sister subject by the introduction into engineering of the internal-combustion engine. For the first time in the history of man, power was available in engines of small enough weight for flight. Santos Dumont, Farman, Bleriot and others left the ground on several occasions for short periods of time, but another vitally important development was required before flight could be said to be fairly launched. This came from the Wright Bros. in America. The lateral control of the early aeroplane was very defective and nothing equivalent to ailerons existed. The Wright Bros. devised a system of wing warping by means of which the angle of incidence on the falling wing could be increased. This warping was coupled with a suitable rudder movement so as to produce a turn without side-slipping, *i.e.*, a naturally banked turn. Much of the Wrights' work was done in secret and is now dated back to 1903, whilst the world in general was very sceptical of rumoured achievements for some further years. The European flights of 1908 convinced the critics that a new invention had made sustained flight a reality, but even then an hour was a long time for a single flight.

It is fortunate—or perhaps natural—that all troubles do not develop simultaneously. Had it been possible to reach speeds of 100 m.p.h. with the craft of 1909 it is certain that wing flutter would have occurred. It may be that the monoplane accidents committee of 1910 had to deal with cases of flutter, but the world knew so little about aviation that flutter was not even discussed. From that enquiry, however, there arose an Inspection Directorate, an Airworthiness Department and an enquiry into the stability of aeroplanes.

In 1909 one aerodynamic laboratory of importance existed, that of Eiffel in Paris. It was an example of personal enthusiasm quite unrelated to commercial aggrandisement. The first volume of tests on wing forms from Eiffel's Laboratory constituted the working library of the design office. For the first time, values of lift, drag and centre of pressure for wings of modern type, were available.

By the courtesy of Eiffel numerous tests for inventors were carried out without cost, the laboratory retaining the right to choose which experiments it should carry through.

Such was the state of aerodynamic knowledge in 1909, when Britain began to take to the air. From the scientific point of view, one of the more important subsequent happenings was the appointment of the Advisory Committee for Aeronautics.

On May 5, 1909, the Prime Minister announced in the House of Commons that he had appointed the Committee.

"The Government is taking steps towards placing its organisation for aerial navigation on a more satisfactory footing. With a view to securing that the highest scientific talent shall be brought to bear on the problems which have to be solved in the course of the work of the two departments (Admiralty and War Office), the National Physical Laboratory has been requested to organise at its establishment at Teddington a special Department for continuous investigation—experimental and otherwise—of questions which must from time to time be solved in order to obtain adequate guidance in construction."

The Committee had as its President the late Lord Rayleigh, O.M., F.R.S., and as its Chairman Dr. R. T. Glazebrook, F.R.S. The Chairman, now Sir Richard Glazebrook, still controls the activities assigned to the Advisory Committee for Aeronautics, which were later handed on to the Aeronautical Research Committee. It is generally understood that the inception of this committee was due to the late Lord Haldane, who was a firm believer in the value of scientific enquiry as an aid to practical success.

A glance through the report of the Advisory Committee for Aeronautics for 1909–10 will show more clearly than any other record where Britain then stood in its knowledge of aerodynamics.

A wind tunnel 4 ft. square had been constructed at the National Physical Laboratory, in which a speed of 30 ft./sec. could be kept uniform. A balance had been constructed for measuring lift and "drift." A whirling arm had also been erected, but no work had been undertaken. Other work related to meteorology and to tests of balloon fabrics. The aeronautics section was then part of the engineering department.

At the present time the N.P.L. has a separate aerodynamics department, with its own superintendent. The equipment consists of some six tunnels, three of which have a working stream of air, 7 ft. square, whilst the largest has a section 7 ft. by 14 ft., and motors capable of giving steady speeds up to 100 ft./sec. The staff at the National Physical Laboratory has remained primarily an adjunct of the Aeronautical Research Committee. Its help in attempts to solve problems referred by the Air Council is directly available to the Committee, and the arrangement is one to which considerable importance attaches. The scope of the experimental work is confined to models, and the effects of scale have been continuously borne in mind.

It is, of course, fundamental that full-scale results are the end of aerodynamic research, but experience has shown very clearly that direct attack in the air has formidable limitations, and is very costly. In Britain, we now have a Director of Scientific Research at the Air Ministry with a capable staff at the Royal Aircraft Establishment, Farnborough. In the twenty-one years under review great progress has been achieved in the making of precise observations in flight. At the beginning of the period the establishment was a balloon factory, and later was concerned with the early non-rigid and semi-rigid airships. One of the notable days of the organisation came with the flight of the B.E.2 aeroplane; this was followed in the course of two years by a full-scale research in stability leading to the B.E.2*c*. It is probably fair to say that those years settled the problems of stability in normal flight so completely that little more has been heard of them—the solution now seems to be so easy. The problems of stalled flight were hardly envisaged. To aid in its investigation the R.A.E. has two wind tunnels, one of which gives the high speed of about 150 ft./sec. over a section 7 ft. square.

The research work at the R.A.E. is controlled by the Director of Scientific Research, but the advice of the A.R.C. is

sought regularly and fully, so that the co-ordination of model and full-scale work is excellent. Recently two other Air Ministry stations at Martlesham Heath and Felixstowe have begun to add items of research to these programmes.

Abroad, progress in aerodynamical science is mainly due to the U.S.A. on the experimental side and to Germany for advancement of theory. In March, 1915, the President of the U.S.A. established the National Advisory Committee for Aeronautics, with functions closely allied to that of its British precursor. The N.A.C.A. has an extensive equipment, and has made a special study of the pressure distribution on the main planes and tail organs of a fighting aeroplane during complex manœuvres. Some of the tunnels are of the closed—or N.P.L. type, but the largest and most recent addition is of the open-jet—or Eiffel type. This tunnel is 20 ft. in diameter, and speeds up to 100 m.p.h. are reached; in it full-scale airscrews can be tested and the cooling of engines with its relation to drag can be investigated for aeroplanes having a single engine. After a comparatively short experience American technical opinion is enthusiastically in favour of this latest aid to aerodynamic experiment.

Another unique unit (a tunnel using compressed air) belongs to the U.S.A. Britain is now constructing a tunnel on the same principle. To appreciate its importance it is necessary to go to one of our soundest theories: in a special form the principle of dynamical similarity as applied to real fluids was first stated by Osborne Reynolds, but the present general statement is due to the late Lord Rayleigh and will be found in the first report of the A.C.A. At the beginning of our 21-year period the aerodynamic law was not readily accepted, and a struggle was in progress between the new science and the older naval architecture.

The aerodynamic law is inconvenient; it asks for higher speeds for smaller models if the tests are carried out under normal atmospheric conditions. Not only does this lead to speeds unreachable in a laboratory, but it also leads to forces which cannot be supported. By compressing the air the problem is much simplified, for a twentieth-scale model can be tested under the equivalent of full-scale conditions with a force on the model one-twentieth of that on the full scale. The British tunnel will have a circular working section 6 ft. in diameter enclosed in a boiler-like exterior 17 ft. in diameter, 2½ in. in thickness; and this structure represents a remarkable engineering achievement.

Aerodynamics is still mainly an experimental science. At the present time there is a marked activity in those branches of the science which delve more deeply and which attempt to use mathematical analysis to account for the details of fluid motion. The position is being forced by the immense number of detailed problems now of interest to aircraft designers. Twenty-one years ago aerodynamic laboratories were carrying out systematic variations of wing section in order to find those of greatest efficiency. The lift/drag ratio of the best wings was supposed to be 13, whereas now it is 25 or more; the "supposed" is necessary, for the large scale effect on small models was then little known and Mr. Lanchester was almost alone in venturing on a prediction of its amount.

Owing chiefly to the efforts of Prof. L. Prandtl, of Göttingen University, a theory now exists which is proving itself to be of great practical value. Aerodynamic theory is now rather like the physical theory of light; Sir William Bragg recently said that physicists used the electron theory on Mondays, Wednesdays and Fridays, and the wave theory on the alternate days. Both have uses, but reconciliation of the two ideas has not yet been achieved. So it is in aeronautics. In our experimental work we assume that viscosity is an essential property of air, and the building of a compressed-air tunnel is the latest expression of that belief. The practically useful theory of Prandtl comes from considering air as frictionless or inviscid. I can imagine certain challenges to this statement, for viscosity in a general way is called in to produce the motion to which the mathematics applies. It is, nevertheless, true that all the symbols used are those of potential flow and are appropriate only to inviscid fluids.

The preliminary groundwork is, perhaps, most justly attributed to Kutta, who modified the older Eulerian theory of fluid motion by adding a circulation round an aerofoil. The analysis was made much more pretty and effective by Joukowsky, who showed how a circular cylinder and the streams round it could be transformed into an aerofoil and its corresponding streamlines. The expression "Joukowsky aerofoil" is now part of technical aeronautics. The Kutta hypothesis so generalised simulates a lift but not a drag; it is possible to deduce the lift and pressure distribution at any angle of incidence—short of stalling—from theory alone. A comparison with experiments shows striking similarity of pressure distribution but a calculated lift some 25 per cent. in excess of that observed. This difference is attributed to the effects of viscosity, and Prandtl examined the consequences of supposing that these effects were confined to a "boundary layer" in contact with the aerofoil, the thickness of the layer being small. The most complete check of this hypothesis is due to the N.P.L. at the instance of the A.R.C. The necessary measurements of pressures and velocities were made, and it was shown that the theoretical relation between lift and circulation was satisfied to a high degree of accuracy. This theoretical relation is now used as a practical basis for deducing the circulation of the mathematical theory from the measured lift.

Prandtl's second hypothesis leads to formulæ for the effects of variation of aspect ratio, gap in biplanes, etc. He regards the aerofoil as being continued—effectively—by trailing vortices; the direction of these vortices is that of the wind, and they rotate so as to produce a downwash both at the aerofoil and behind it. The consequences are that the effective angle of incidence of the aerofoil is changed by an amount depending on the aspect ratio or gap. Prandtl found that an elliptical distribution of lift across the span gave a uniform minimum downwash, and this has been adopted as a general basis for theoretical applications. The proof of the pudding is in the eating, and an examination of tests on aerofoils of different aspect ratio by this theory shows that over a range from 2 upwards all the observations are brought into agreement. The result is so striking that all doubts as to a substantially correct basis are overcome. The physical restriction to be remembered is that the theory applies only to bodies having a high ratio of lift to drag. It is essentially an aerofoil theory.

The number of deductions of practical value is growing. One of the more recent successes is that which shows how best to treat a centre section of reduced chord in order to maintain good aerodynamic qualities of the wing as a whole.

A remarkable experimental success in relation to aerofoils was achieved by Handley Page and Lachmann in the later section of the period under review. By making a passage for air from the pressure region under an aerofoil to the suction region above, it was found that the properties of the wing could be materially affected. The general effect was the postponement of stalling to a higher angle of incidence. The breakdown of flow which we call "stalling" is due to loss of energy by viscosity as the air moves over the aerofoil's surface, and the slot appears to act by blowing away the stale air. This explanation is borne out by experiments on "sucking away the boundary layer." Effects similar to those of a slot are produced by drawing air into a hollow wing.

The chief utility of the slot is, however, an indirect one and has been largely influenced by the Control and Stability Panel of the Aeronautical Research Committee under the chairmanship of Prof. Melvill Jones. Concerned with the difficulties of handling a stalled aeroplane, and the serious consequences of failure, the Panel made a mathematical and experimental analysis of the problem. Broadly it appeared that the older ailerons produced a yawing moment which, after a second or so of application, overpowered the rudder. Correction by unstalling followed an application of the elevator in most cases with a very considerable loss of height. It was realised that the slot could be used to unstall a wing, and further work led to the now well-tried slot-and-aileron control. The final practical step was taken by Handley Page and Co., when the automatic slot was invented and the mechanical complication of the slot came within the limits of aircraft engineering.

Twenty-one years ago a speed of 60 miles an hour was the highest reached. In the last year of the period the extremely high speed of 357 m.p.h. was recorded by a British seaplane. This great change is very largely due to engine development, a subject with which we are not here concerned. The pinnacle of success has, however, only been attained by using all the resources at hand. The largest of British tunnels—the 7 ft. by 14 ft. Duplex of the N.P.L.—was used for approximately two years on large models of seaplanes designed for the Schneider Cup races of 1927 and 1929.

An interesting analysis of the performance of these very fast craft leads to the discovery that the resistance is not materially different from that of a thin flat plate of the same superficial area moving in its own plane. In other words, streamlining is approaching the limit at which aerodynamics at present aims—skin friction only.

The development of speed has introduced its own special problems. The loading of an aeroplane can be increased many times by vigorous turning at high speed. The human

element is beginning to feel the effects, for a temporary blindness is not unknown as a consequence of rapid turns. There exists an excellent instrument for measuring these loads which arise from centrifugal accelerations, and it is well known that loads three times normal are frequently met with. Five times the normal weight is not uncommon, and in specially designed aircraft pilots making an attempt have reached 10 times the normal loading. It is clear that this loading is near the limiting strength of the human structure, and it is probable that—given an aeroplane which is stable at high speeds—the physiology of a pilot will limit the overload to something more nearly 5 than 10, except in an extreme emergency. Approach to the ground at high speed is the one emergency calling for maximum use of the strength of the craft.

Such considerations have led to a system of load factors to which British aircraft must conform, in order to comply with the law. A load factor of eight is not difficult to achieve, but this corresponds with a factor of safety which may not exceed 1½, and for this reason aeronautical engineering is more specialised than its predecessors. Best materials, best methods of calculation, workmanship and inspection are required. These conditions were foreseen as early as 1910, and suitable organisations were called into being.

It happens inevitably that the problems of yesterday which have been solved seem to be simple, but it is almost certainly true that aerodynamic research is now much more complex than it has ever been. The problem of "flutter" has become important with the introduction of high speed. It is not entirely a new phenomenon, except in its more general incidence. One of the first airscrews tested on the whirling arm at the N.P.L. fluttered. During Bush's experiments on the B.E.2 aeroplane at Farnborough wing flutter occurred, and the pilot's hand was knocked against the sides of the cockpit in the violence of the movements. Tail flutter had been observed in a large biplane, and a sufficiently general theory to allow for elimination had been found before 1916 was ended.

Recent flying showed dangerous stresses in aircraft due to flutter, and at the request of the Air Council a new enquiry was set on foot by the A.R.C. The Royal Aeronautical Society recently arranged a lecture by Mr. Frazer of the N.P.L., at which the conclusions were illustrated very effectively by special models. The enquiry was mathematical on one side but the conclusions are simple and practical; whether it be wing flutter due to ailerons, etc., or tail flutter due to elevators or rudder attention to the mass distribution during design will ensure freedom from trouble. The authors of the A.R.C. monograph on flutter applied their knowledge to the Schneider Cup racers.

The mathematical analysis was required to point the way and to ensure a treatment as complete as our capabilities allow. At the outset it was not clear that success was attainable on those lines, and an alternative attack was simultaneously pursued. The Royal Aircraft Establishment suggested the use of a scale model in which the scale was extended to cover elasticity of parts as well as their geometrical form. An examination of the details showed the practicability of the method and a model of an aeroplane which flutt[illegible]d in flight was made and tested with entirely conclusive results. Prediction is possible along these lines and it is fair to conclude that aerodynamic knowledge is now adequate for the prevention of flutter.

Another old problem has come up for further consideration, that of spinning. It will be within the recollection of many that much trouble was caused twenty years ago by stalling and spinning, although the trouble was expressed in other words. FLIGHT will show you in its early volumes an account of an event called "Parke's Dive." For years "stalling" ended the explanation of this danger, but a series of enquiries by the accidents investigation committee of the A.R.C. led to the discovery of autorotation and its calculation. It at once became apparent that the elevator was an important organ of control in correcting the consequences of spinning. Elaborate manœuvres, well above the ground, were made with confidence, whereas 21 years' ago turning was an adventure, looping and upside down flying unknown.

The next step was the enquiry which led to the slot and aileron control mentioned earlier. Each development has had its effect, but more is needed; as the old manœuvres became safer pilots extend their range and new difficulties are encountered. It may be newness only, but with our present eyes the prospect is forbidding. The technique in the laboratories is being extended beyond previous limits in an attempt to find an understandable solution of the remaining difficulties. Small models in Balsa wood are being made and fitted with fuses which operate the controls at appropriate moments in order to test devices for recovery. The way may be long but the method of scientific enquiry is powerful.

The aerodynamic problems connected with airships have not proved to be formidable. In spite of their great size and the consequent difficulty of reproducing full scale conditions in a laboratory, there has not been any failure to give the guidance necessary for design. This may be fortuitous. Indirectly, aerodynamic considerations have had a fundamental effect on the design of our two new airships R 100 and R 101. Prior to them, airships had been designed primarily on a basis of static forces, but the failure of R 38 in flight brought to light the inadequacy of this basis. A series of investigations was undertaken and a new set of design conditions deduced which were based fundamentally on a consideration of all the factors involved. It was not possible to foresee accurately the limits of practical possibility but it did appear feasible to design an airship capable of withstanding any sort of bad weather short of that in the centre of a thunderstorm. Now that the airships are completed there is no need to go back on the expectation of 1924. The exact future of airships and of aeroplanes is still unknown, but it will be an unusual experience in the world if it lets pass any opportunity for improving its communications. For long distances covered quickly, the airship is the most promising of known means of transport. It still suffers from its infancy—the equivalent of the docks and ports of the ocean liner have still to come, just as have the municipal aerodromes, etc., for aeroplanes. International barriers are beginning to assume a new importance, and time itself is an important element in producing the final effect. At the same time the effect will come more quickly if a steady policy be pursued with the fullest insight into the problems involved.

So far as the future of scientific aerodynamics is concerned, a future comparable with that in electron theory seems assured, but a difficult interlude must first be faced until aviation expands into the commercial field and provides those prospects which will attract the best students. For those already in the aeronautical industry the difficulties are much the same and we can all join in the wish for the general prosperity of our country in order that our own more selfish interests may benefit.

PROGRESS

A Pictorial Review in "Flight" Photographs

LOOKING back is always fascinating, whatever the subject concerned may be, but when it is the early history of aeronautics we dig into, then it is interesting indeed. During the course of the general editorial duties of producing FLIGHT, it is frequently necessary to refer back to the earlier volumes of FLIGHT for information on some particular event, and we have found that as we turn over the pages of the yearly volume in search of our object—well, we generally find ourselves neglecting our real mission, and, instead, becoming deeply absorbed in those hundred and one *other* events in the early flying days.

In our present review of the twenty-one years of progress of flight this looking back process, through 21 volumes, assumes gigantic proportions, and we find that our first good intentions of presenting our readers with a *resumé* of that progress turns out to be a case of "easier said than done." It would not be a particularly easy proposition to condense the matter available in one *volume*, let alone one *issue*.

THE FIRST BRITISH AERODROME: Eastchurch Flying ground opened by the Royal Aero Club in 1909.

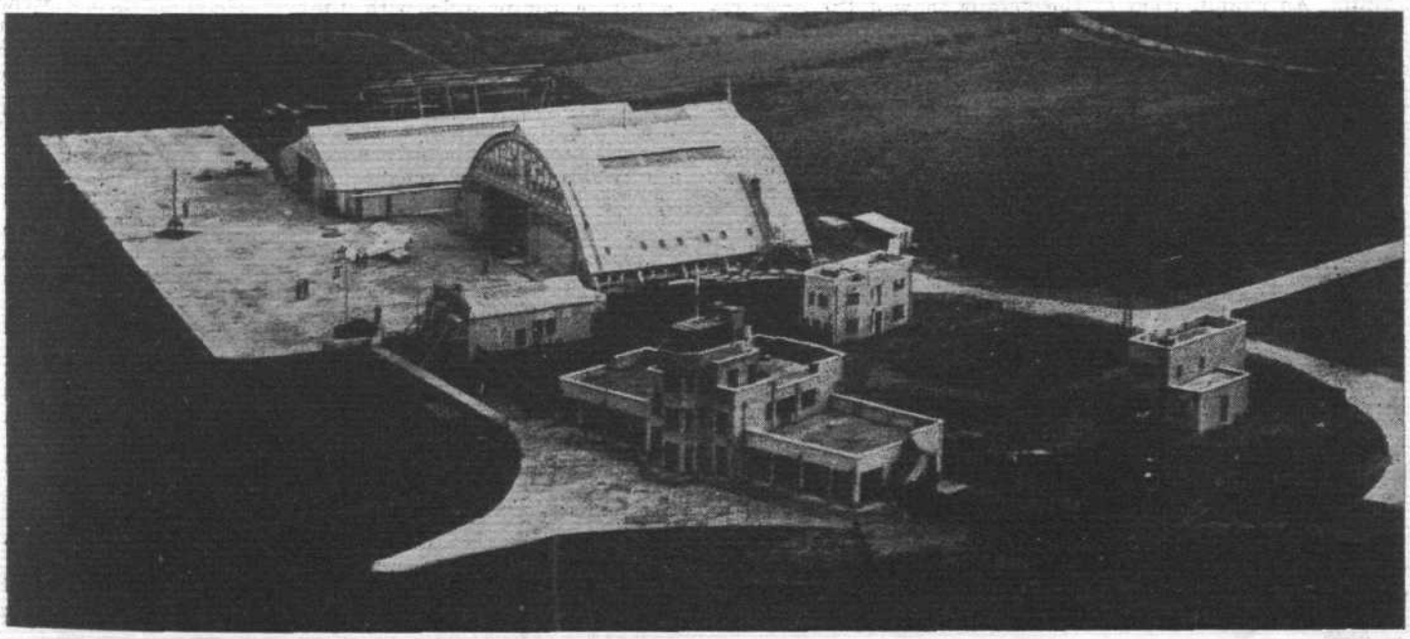
Under the circumstances, therefore, we are forced to content ourselves with just a few general remarks on the various aspects of flight during this period, and to reproduce a selection of FLIGHT photographs of pilots, aircraft and events, etc., covering the 21 years. After all, the development of the aeroplane itself is, perhaps, the best indication of the progress made in aeronautics, so that our collection of photographs, together with the accompanying text, should, apart from their general interest, give a fair impression of the progress of flight.

On the first page of No. 1, Vol. I, of FLIGHT (reproduced on p. 11), there was a picture bearing the following inscription: "A second Englishman flies: Mr. J. T. C. Moore-Brabazon, who is so well known in connection with ballooning, and who is a member of the Committee of the Royal Aero Club of Great Britain and Ireland, is the second Englishman to fly with his own machine, sharing with Mr. Henry Farman that distinction. On December 3 (1908), at Issy, he made three consecutive flights of 500 to 600 metres each, our photograph above being secured during one of these. The motor he employed is an ordinary 50 h.p. Vivinus; the aeroplane, upon the lines of the Voisin-Farman biplane, was also constructed by MM. Voisin Frères."

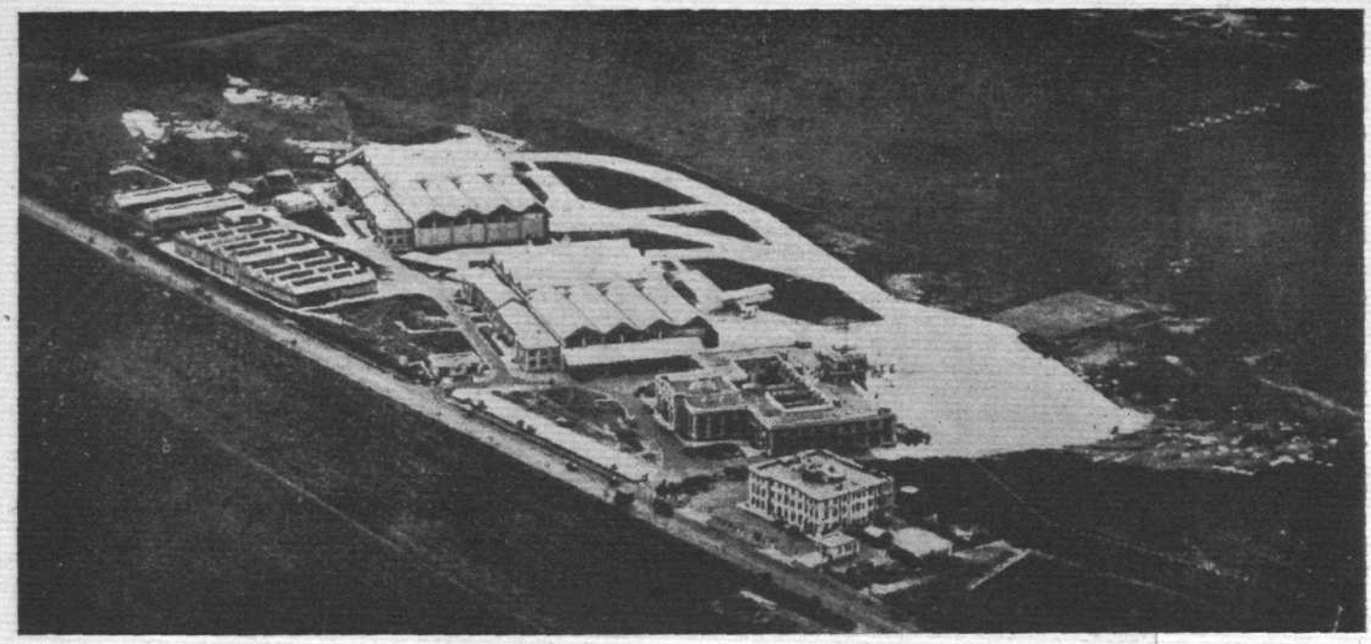
FLIGHT thus began with the recording of an Englishman's effort in the conquest of the air, a fitting opening, we think, although Great Britain was then sadly behind the other countries in practical aeronautics.

These flights—or rather hops—and those of the other pioneers of that time, such as Bleriot, Henry Farman, the Wright brothers, Delagrange, Esnault-Pelterie, Santos Dumont, etc., were all more or less "short but sweet," frequently ending with mishaps. Perhaps the most successful flights were made by the Wrights, as indicated by a description, in No. 1 of FLIGHT, of their flight for the Michelin Cup at Le Mans on December 18, 1908. Wilbur Wright had come to Europe to show the world that he really could fly—for previously his reported flights in America were shrouded somewhat in mystery. It may further be added that his flights in Europe caused something of a sensation, as they were obviously far in advance—in quality if not in quantity—of those being made at that time on this side of the Atlantic. To return to the Michelin Cup, Wilbur Wright, on the date in question, made 45 complete circuits of a triangular course of 2·2 km. in 1 hr. 53 mins. 59⅘ secs., equivalent to 99 km., and, in addition, flew 400 m. to and from his starting rail, bringing the total to 99·8 km.—a world's record. On December 31 he improved on this, accomplishing 124·7 km. in 2 hr. 20 mins. 23 secs.

It is interesting to note, in looking through the early pages of FLIGHT, how these first efforts steadily improved. As an example, let us take the flights made by S. F. Cody, on the British Army Biplane. After reconstruction, following a not altogether successful first trial flight in 1908, this machine, constructed at Farnborough under the supervision of S. F. Cody and Col. Capper, reappeared in January, 1909, and throughout the year made several progressively successful "flights" thus:—In January, 20 yds. and 300 yds. (crashed); rebuilt February, short trials (to 400 yds.) on



A MODERN AERODROME: Heston Air Park, one of many aerodromes now in operation all over Great Britain. (FLIGHT *Photos.*)



A MODERN AIRPORT : From the experimental "flying ground" and the private aerodrome we come to the Commercial Airport of to-day, such as Croydon, shown above. (FLIGHT *Photo.*)

Laffan's Plain ; May 14, 1 mile (British record), June, 2 2 miles ; July, 4 miles ; August (remodelled), 6–8 miles, and a flight with Mrs. Cody as passenger—the first woman to go up in England ; September, 40 miles (1 hr. 3 wins.), etc.

At first these flights were confined to the flying grounds, and then the pilots ventured across country, with increasing range year by year, from Bleriot's Cross-Channel "dash," Hawker's and Alcock's Atlantic flights, to the present more-or-less commonplace Atlantic crossings, and long-distance non-stop flights. All these have been recorded in FLIGHT.

Progress is similarly reflected in the FLIGHT reports on the various Aero Shows—from the First Paris Aeronautical Salon, which opened on December 24, 1908, with about 16 exhibits of somewhat crude, "rule-of-thumby" design (?) and construction, and the First British Olympia Aero Show of 1909, onwards. Examples of some of these Show machines will be found in the illustrations reproduced on the following pages.

The majority of these early machines—such as were exhibited in the first Paris Salon—were of the "open" fuselage, or outrigger, type, of wood construction, and in the case of the Bleriot IX, a vellum-like paper was used for the wing-covering! An exception was the R.E.P., which had a very small body of steel tube construction entirely covered with fabric ; it also had warping wings and a single wheel landing gear. The Bleriot X was the largest (13 m. span) machine then in existence, and the Santos Dumont "Demoiselle" was the smallest (5 m. span), being the forerunner of the "motor-cycle of the air" of modern times.

As regards aero engines in 1909, these were then beginning to break away from motor-car practice (and the use of fly-wheels !), and air-cooled radials or semi-radials (R.E.P., J.A.P., Anzani, Gnome, etc.) made their appearance in increasing numbers. The water-cooled "V" (Antoinette, E.N.V.) was another type evolved specially for aero work. Few went beyond 100 h.p. and 50 h.p. was the most "popular" power.

In the First Olympia Aero Show (1909) most of the machines exhibited were of foreign design and construction, while the few British examples were mainly "copies" of foreign designs. The next Olympia Show, in 1910, however, saw several original British-built and designed machines, and these increased in number each successive Olympia Show, until the high standard reached in the Show held last year demonstrated that British aircraft holds a foremost position in the world.

Turning to another side of this "looking back" business, perhaps the most interesting of all are the reports of the various flying meetings—from the early meetings producing a mere handful of performers, when pilots "succeeded in completing a circuit of the ground at a height of about 50 ft. ! " to the present-day race meetings, producing entries of over 50 machines, when competitors cover hundreds of miles at speeds rarely less than 100 m.p.h. All recall exciting incidents and show steady progress in the art of flying.

Blackpool in 1909, when Latham flew his graceful *Antoinette* monoplane in a gale, and Rheims of the same year. Bournemouth of 1910, when one of the foremost British pioneer pilots, the Hon. C. S. Rolls, lost his life. And those wonderful Hendon Meetings at the London Aerodrome which were held practically nearly every week-end from 1911 to 1914 ; the exciting races round the pylons and their close finishes ; the exhibition flying and looping ; the Night Flying Demonstrations ; the Aerial Derbys ; and, in recent years, the remarkable R.A.F. Displays.

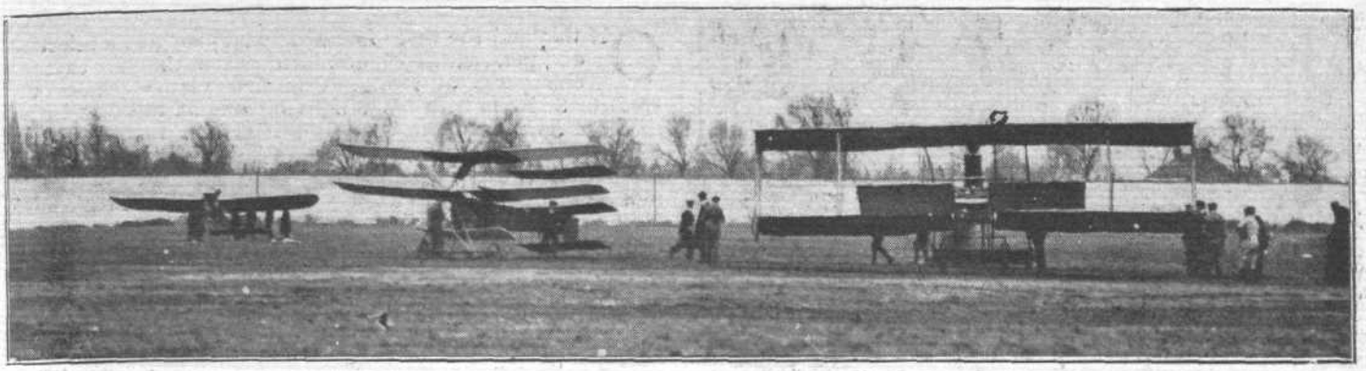
Closely associated with these meetings we have the Schneider Trophy Speed Contests for seaplanes, in which, perhaps, "progress" is demonstrated more than anything else. From the first contest held in 1913 the speeds attained increased from about 60 m.p.h. (officially it was 45·75 m.p.h.) to 86·8 m.p.h. in 1914 ; 107 m.p.h. in 1920 ; 145·7 m.p.h. in 1922 ; 177·3 m.p.h. in 1923 ; 232·5 m.p.h. in 1925 ; 246·5 m.p.h. in 1926 ; 281·6 m.p.h. in 1927 ; and 328·6 m.p.h. in 1929 ! It should be noted that it was not in *speed* alone that progress was made, but the design and construction of the machines themselves showed very considerable progress.

Of other flying events that have to be recalled may be mentioned the London-Manchester race between Claude Grahame-White and Louis Paulhan (won by the latter) in 1910 ; the Circuit of Europe, and the Circuit of Britain in 1911 ; Gordon Bennett Speed Contests (1909-11); while of more recent date, the Glider Competition at Itford in 1922—which recalled the spirit of early flying days—followed in subsequent years by the Light 'Plane meetings at Lympne.

One period of our record of progress, that between 1914 and 1919, comes under the shadow of the Great War, and progress then took the form of a struggle for mastery of the air. The pages of FLIGHT during this period have much to tell, pleasant and unpleasant. Our own progress—and that of our Allies—in aircraft design and construction was naturally "Deleted by Censor," but that of our then enemies was recorded by interesting detailed descriptions of captured "enemy aircraft." Occasionally we were able to describe one of our own war machines—which had been captured by the enemy and described in one of their journals from which we, in turn, gave our description !

In the case of the "enemy aircraft" it may be of interest to recall that the Air Ministry collected representative examples of these together at the Agricultural Hall, Islington—which also served as a huge store for British war aircraft and engines—and a very interesting "Aero Show" in itself was thus formed. It served a useful purpose, also, for the Air Ministry, as well as FLIGHT, prepared careful and detailed reports on the machines and engines for the benefit of British and Allied constructors.

For various reasons—one mainly lack of space—we have been unable to include much of this war-time period in our pictorial review, which we have confined to the civil or peaceful side ; and we think, on the whole, this is of greater general interest.



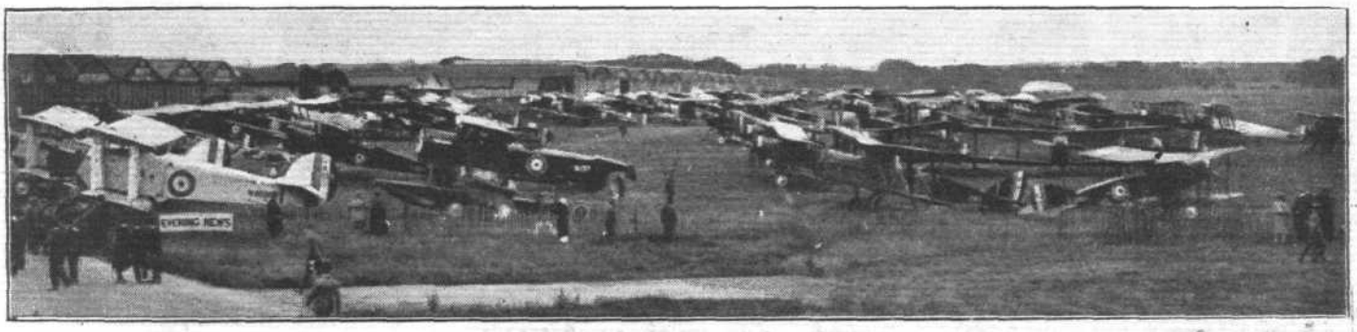
AN EARLY FLYING MEETING: The Easter Monday Meeting at Brooklands, 1910. The Machines are: J. D. Astley's Lane monoplane, A. V. Roe's triplane, and Moreing's Voisin.

For the post-war period, we have numerous long-distance flights, such as the Atlantic efforts of Harry Hawker and Mackenzie-Grieve (on a Sopwith), Jack Alcock and Whitten-Brown (on a Vickers-Vimy), the U.S. Navy squadron under Com. Read (on N.C. flying boats), and the double crossing by Maj. G. H. Scott on the rigid airship R.34, all in 1919. The England-Australia flight of Sir Ross Smith and Sir Keith Smith (Vickers-Vimy), also in 1919; England-Cape by Sir H. A. Van Ryneveld and Sir C. J. Q. Brand in 1920; Sir Alan Cobham's Empire flights; Lindbergh's wonderful solo Atlantic flight, which preceded a deluge of other Atlantic crossings. Numerous foreign long-distance efforts including the American Round-the-World Flight.

Then we have a new chapter opened, so to speak, by the arrival of the light 'plane and the formation of the Light 'Plane Clubs, and some wonderful accomplishments on these small machines. Commercial aviation also made great progress during the post-war period—our unsubsidised passenger and mail cross-Channel services developing into the present-day big undertaking of Imperial Airways with its services extending to India and further extensions looming in the near future.

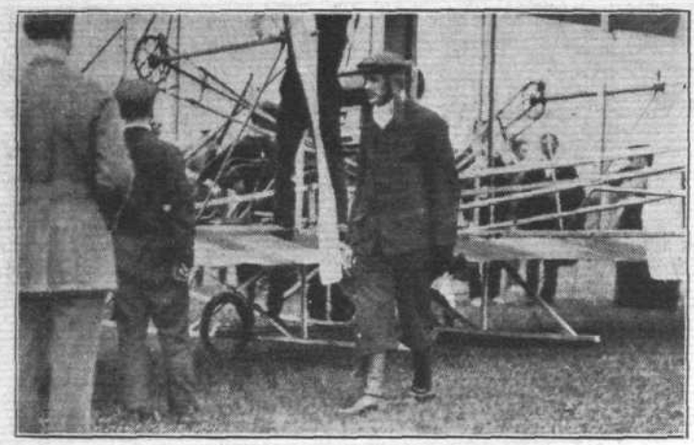
All these items, and many, many others confront us as we go through our volumes of FLIGHT, and we wish we could dwell at length upon them—but, as we said before, our readers must content themselves with the FLIGHT Pictorial Review that follows.

Finally may we point out here that airships have not been included in this section, for this subject has been dealt with elsewhere in this issue.



AND A MODERN FLYING "MEETING": A typical scene at one of the R.A.F. Displays at Hendon (actually, the Third Display, 1922), showing *some* of the machines taking part.

AN ANGLO-AMERICAN PIONEER: The late Col. S. F. Cody, who carried out tests with the British Army biplane in 1908-9, and later became a naturalised Britisher. (FLIGHT *Photos.*)



ON this and the three following pages we give a selection of "personalities" prominent during the past twenty-one years of flying. Our first picture shows the Hon. C. S. Rolls with his Wright biplane at the first International Aviation Meeting at Bournemouth, 1910, where he met with a fatal accident whilst taking part in the landing competition. His death robbed Great Britain of one of its most honoured and enthusiastic pioneer airmen and balloonist. He was one of the first group of "experimenters" who began flying at the Royal Aero Club's aerodrome at Eastchurch.

Below are six more "Old Timers"; they are (from left to right) Capt. B. Dickson, who took part in many of the early flying meetings at home and abroad; A. Rawlinson, who obtained the R.Ae.C. pilot's certificate No. 3 on April 5, 1910; George A. Barnes, who flew the Humber-Bleriot monoplanes in 1910; Alec Ogilvie, another of the early Eastchurch colony, who flew a Wright biplane; Cecil Grace, also of

Eastchurch, who lost his life making a flight over the Channel in 1910; J. T. C. Moore-Brabazon, who was the first to fly at Eastchurch (Feb. 27, 1909, on a Voisin biplane "Bird of Passage"), and later (Oct. 30, 1909) won the *Daily Mail* £1,000 prize for a circular flight of one mile on a Short (Wright-type) biplane.

Four more "Old Timers" come next: J. A. Drexel, W. B. R. Moorhouse, and J. Radley, who all flew Bleriot monoplanes; and "Mr. Jones," or otherwise Robert Lorraine, who became famous as an airman at the Bournemouth Meeting, 1910.

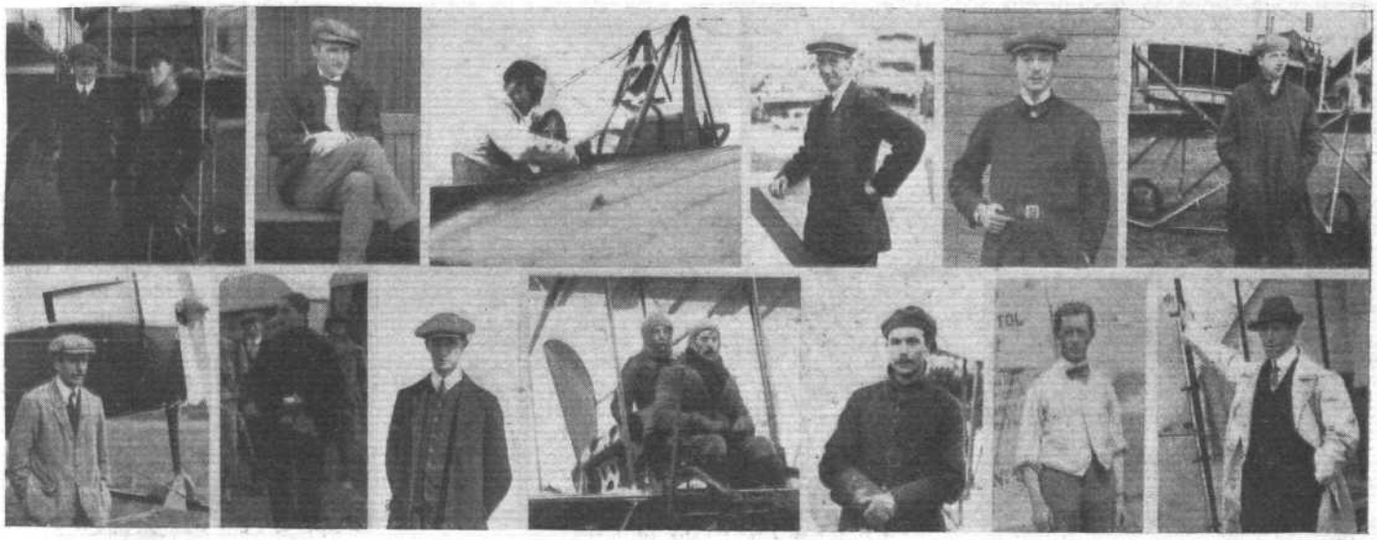
Next we have the first four Naval Officers trained as air pilots, A. M. Longmore, C. R. Samson, R. Gregory and E. L. Gerrard, who were taught by G. B. Cockburn at Eastchurch duing 1910.

Above are: W. E. McArdle, who, with A. Drexel, opened a flying school near Beaulieu in 1910; G. C. Colmore, who learnt to fly at Eastchurch, 1910; the Hon. Alan Boyle, who was one of the first Brooklands pilots; D. G. Gilmour, another Brooklands pilot, who flew Bristol and Martin Handasyde monoplanes; Marcel Desoutter, one of the early Hendon pilots who gave splendid displays on the Bleriot.

(FLIGHT *Photos.*)

In May, 1909, Orville and Wilbur Wright paid a short visit to England, and after an interview with the War Minister they made a tour of inspection of the Royal Aero. Club Flying Ground at Eastchurch. Our picture on the right shows the Wright Bros. with Mr. Horace Short, after a visit to the Short Bros. factory where Wright biplanes were then being constructed.

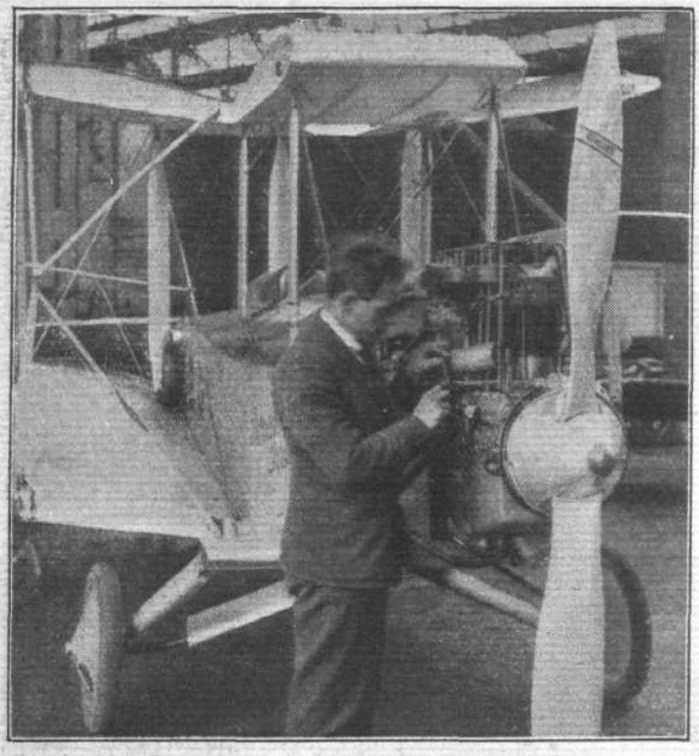
Above we show a characteristic portrait of George Reynolds at work on one of the hangars at Brooklands in 1910. "G. R." has been official timekeeper at most of the important flying races from the early days up to the present time.



Here are some more early British pilots: from left to right (top), Eric and Cecil Pashley (Shoreham); T. A. Rainey (Eastbourne); H. A. Petre, who with his brother Edward, belonged to the Brooklands colony; P. P. Raynham, Maurice Ducrocq, Jack Alcock; (bottom) H. Barnwell, S. V. Sippe, R. C. Kemp, Mrs. Maurice Hewlett and M. Blondeau, Howard Pixton, C. P. Pizey, and F. W. Merriam, all of Brooklands.

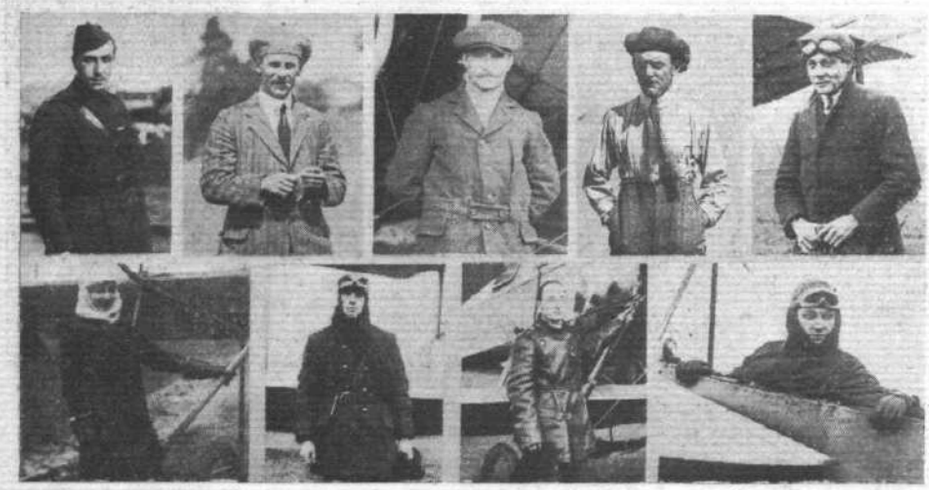
An interesting group of pilots taken at Hendon, is shown above; they are (left to right) back row: J. L. Weston, E. T. Willows, A. V. Roe, W. H. Ewen, N. C. Spratt, R. T. Gates, Gordon Bell, C. H. Greswell, W. E. de B. Whittaker, W. Birchenough, M. Chevalier and J. C. Porte. (Seated): M. Teulade, R. H. Carr, Sydney Pickles, Pierre Verrier, Robert Slack, Lewis Turner, and E. Marty. (Front): W. L. Brock, Louis Noel, and M. D. Manton.

FLIGHT *Photos.*]



Three popular pilots, now, unfortunately, no longer with us, are shown above—James Valentine, who joined partnership with R. F. Macfie at Brooklands; J. L. Travers, of Hendon-cum-G.-W. Box-kite fame; and E. V. B. Fisher, another Brooklands man.

Our picture on the left shows "Bert" Hinkler adjusting the "Cirrus" engine of his Avro "Avian" light 'plane before setting out on his remarkable lone flight from England to Australia in 1928. He accomplished the journey to his native land in the record time of 14 days, and on arriving there flew on to his home town and other parts of the Commonwealth—naturally receiving an enthusiastic reception everywhere.



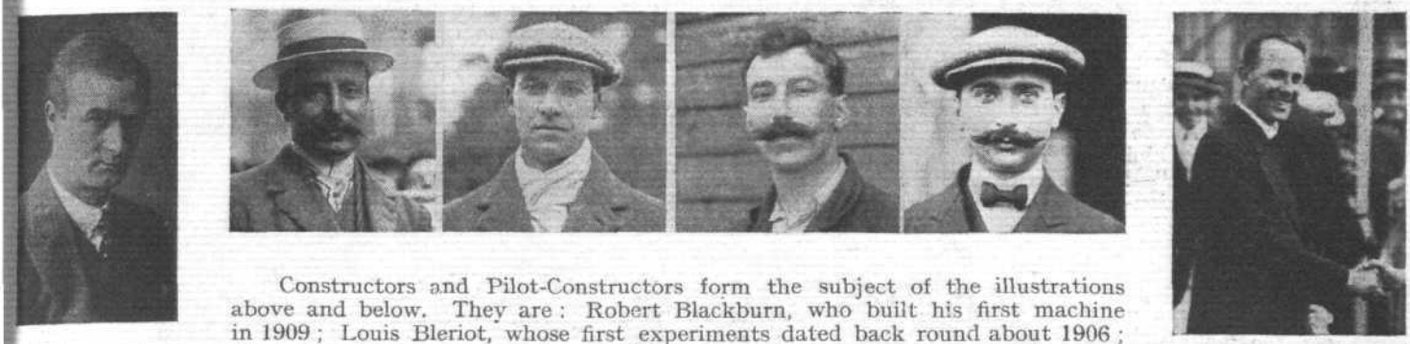
Next we have 9 more well-known pilots, as follows: "Frankie" Gooden, originally a parachutist, then, after building an experimental monoplane, in 1912, piloted a Caudron at Hendon. Later he joined the R.A.E. and met his death during a test flight. Compton Paterson (who subsequently opened a flying school in South Africa), M. Salmet (Bleriot School), B. C. Hucks (the first Englishman to loop), L. A. Strange, Mrs. de Beavoir Stocks (who met with a serious accident when flying as passenger), Spenser Grey, R. Ding (who flew the Handley-Page biplane), and Gustav Hamel, who was a wonderful exhibition pilot of the Bleriot and Morane monoplanes.

These four hail from Brooklands, being Gordon England, who sampled many different types of aircraft, including the Weiss monoplane; H. Busteid (Bristol), F. G. Jenkins (Avro), and J. D. Astley (Antoinette monoplane, etc.).

On the right three personalities well known in early aviation circles. Left, Mr. F. W. Lanchester, whose early work on aerodynamic theory is only now being appreciated, Centre, Mr. H. E. Perrin, Secretary of the Royal Aero Club since its foundation, and on the right, Mr. Handley Page, one of the pioneers of British aviation.

[FLIGHT *Photos.*

Sir Hiram Maxim, Lord Northcliffe, T. O. M. Sopwith, Henry Farman, Claude Grahame-White, and Sir Francis McClean, shown above, are names too well known in the world of aeronautics to need any explanation here.



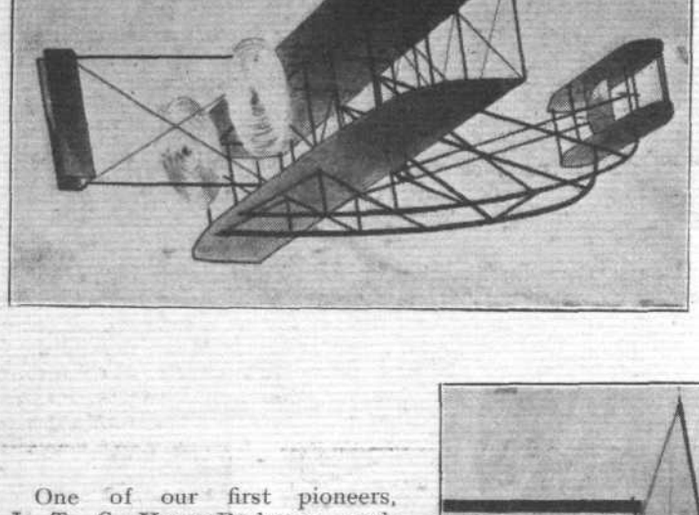
Constructors and Pilot-Constructors form the subject of the illustrations above and below. They are: Robert Blackburn, who built his first machine in 1909; Louis Bleriot, whose first experiments dated back round about 1906; G. de Havilland—the breeder of "Moths"; Leo Jezzi, an early experimenter at Eastchurch with automatic stability; P. Peier, who designed the first Bristol monoplane; Harry Hawker, whose untimely death cut short his constructional powers.

Above we have: G. Holt Thomas, who formed the Aircraft Mfg. Co.; H. P. Martin and G. Handasyde; J. W. Dunne, inventor of the remarkable inherently stable machines bearing his name; and Maurice Farman, brother of Henry Farman.

Some distinguished foreign pilots who visited England:—C. T. Weymann, winner of the Gordon Bennett race flown at Eastchurch, 1911; Louis Paulhan, winner of first London-Manchester Air Race, 1910; M. Chanteloup, who gave demonstrations on the Caudron; Jules Vedrenes (Morane); A. Pegoud, who gave the first exhibitions of looping in England; M. Chevillard produced thrills in a Henry Farman at Hendon (Capt. C. Tyrer in the passenger's seat); R. Garros (Morane-Saulnier); and M. Prevost (front cockpit) in the Bleriot.

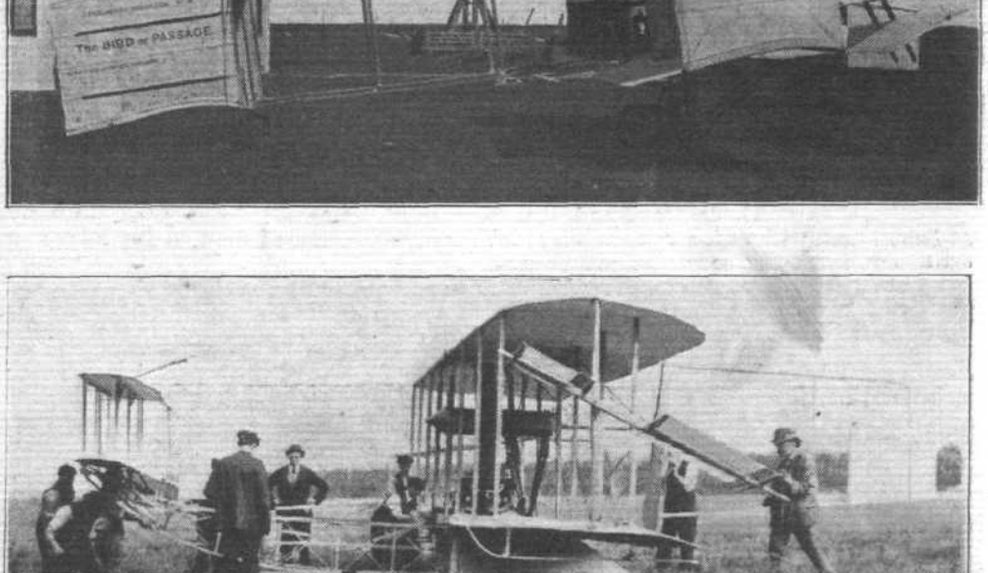
FLIGHT *Photos.*]

THE FLEDGLINGS

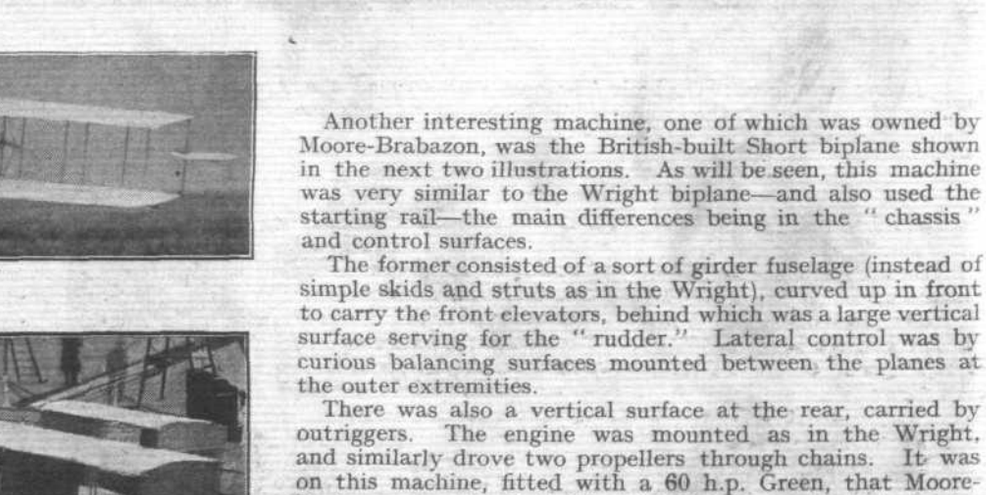


ALTHOUGH, strictly speaking, the early Wright biplane, shown herewith, had advanced a little beyond the "hopping" stage at the time we open our Twenty-one Years' review, it is only proper—we nearly said "Wright"—to include it, for the improved version figured prominently during the first two or three years of "our" life. Original Wright-type biplanes were, it will be remembered, constructed in England by Short Bros. at their Eastchurch factory, and several British aviators owned or flew them, including the Hon. C. S. Rolls, Hon. M. Egerton, T. McClean, Alex. Ogilvie, Colin Defries, and others.

The first models employed the starting rail gear for getting into the air, but subsequently wheels were fitted to the skids, and a horizontal tail was also added.



One of our first pioneers, J. T. C. Moore-Brabazon—and, incidentally, perhaps our first Private Owner—made his first flights on a Voisin biplane, "The Bird of Passage"—shown in our second illustration—on which he flew in France in 1908, and later brought to Eastchurch. The Voisin was a curious looking machine, the principal features of which were the side "curtains" between the main planes—which were claimed to give stability—and the box-tail. It had no lateral control such as ailerons or wing warping, for the side curtains were supposed to render this unnecessary. For horizontal control a pair of elevators were mounted forward, on the nose of a short nacelle or body carrying pilot and engine. The latter was a 50-h.p. Vivinus, but E.N.V. and Antoinette engines were also used in these machines.



Another interesting machine, one of which was owned by Moore-Brabazon, was the British-built Short biplane shown in the next two illustrations. As will be seen, this machine was very similar to the Wright biplane—and also used the starting rail—the main differences being in the "chassis" and control surfaces.

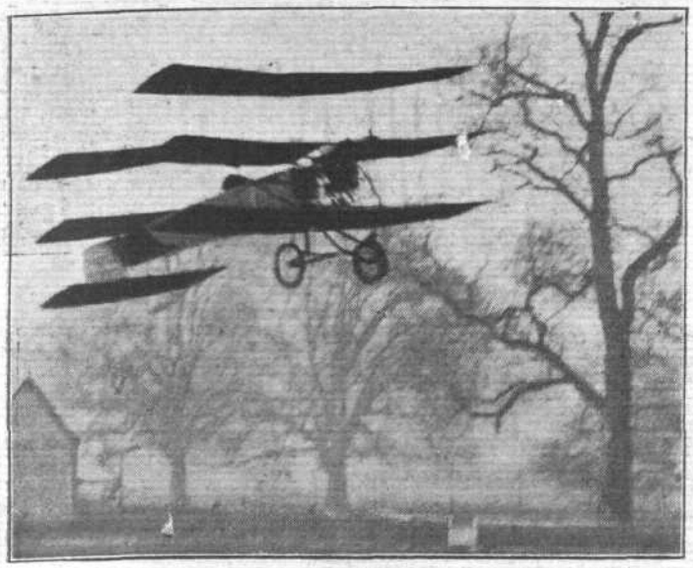
The former consisted of a sort of girder fuselage (instead of simple skids and struts as in the Wright), curved up in front to carry the front elevators, behind which was a large vertical surface serving for the "rudder." Lateral control was by curious balancing surfaces mounted between the planes at the outer extremities.

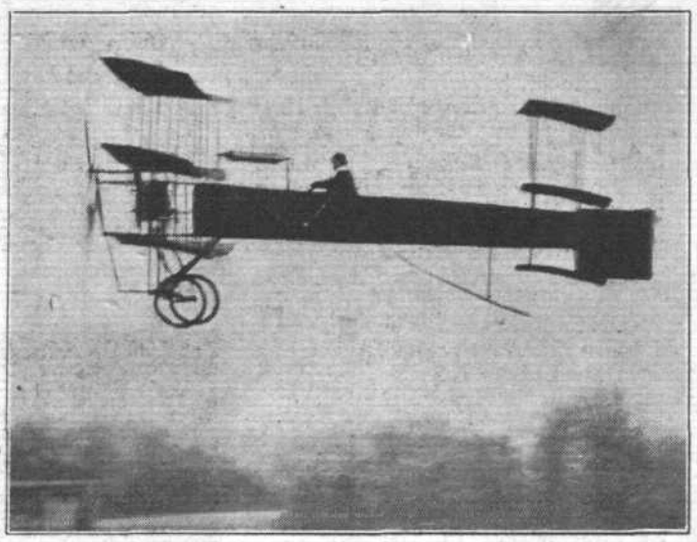
There was also a vertical surface at the rear, carried by outriggers. The engine was mounted as in the Wright, and similarly drove two propellers through chains. It was on this machine, fitted with a 60 h.p. Green, that Moore-Brabazon won the *Daily Mail* £1,000 prize for the first circular flight of one mile on October 30, 1909, at Leysdown. Other machines of a similar type to this one—which was the second type—were constructed by Short Bros.

Our last illustration is another view of the Voisin biplane, exhibited at the First Olympia Aero Show, 1909.

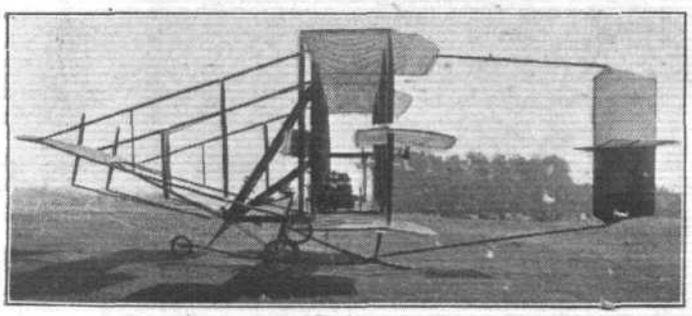
[FLIGHT *Photos.*

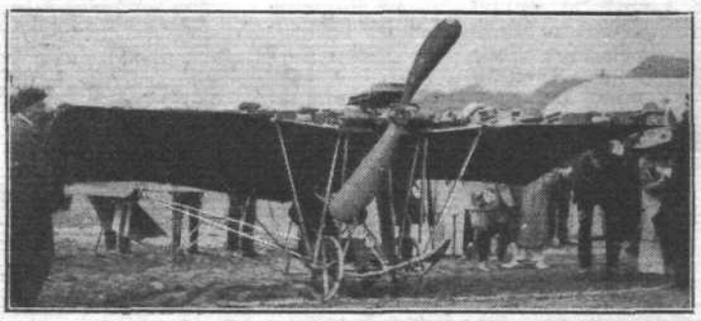
THE FLEDGLINGS





FEW of the early British-built aircraft recall as much interest—and glory—as the Roe triplane shown in the first three photographs reproduced on this page. "A.V.'s" early efforts at—but not his interest in—aeronautics date back to 1908–9, when he built a biplane at Brooklands. Later he built a triplane, with a 9 h.p. J.A.P. engine, which he flew at Lea Marshes. The machine shown here is the one, fitted with a 20 h.p. engine, on which he made a number of successful flights at Wembley in December, 1909, and the following year. The "crash" depicted on the right was the result of outgrowing his "aerodrome," for on one occasion he remained up until the boundary line was reached, and attempting to turn resulted as shown! This machine was the forerunner of the tractor-fuselage types of aircraft which became common in subsequent years.





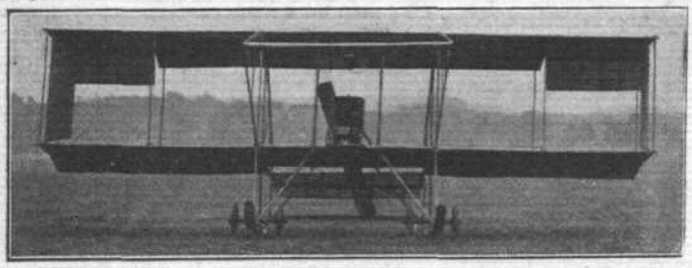
Dignity and Impudence might be the title given to the two photographs reproduced above. That on the left shows the "Flying Cathedral," constructed in 1910 by S. F. Cody, a biplane developed from the British Army "flying machine" of 1908–9 which Cody flew with varying degrees of success. The "Cathedral" was 46 ft. span and powered with a 60 h.p. E.N.V. engine. It flew remarkably well, and similar improved and modified models were produced subsequently.

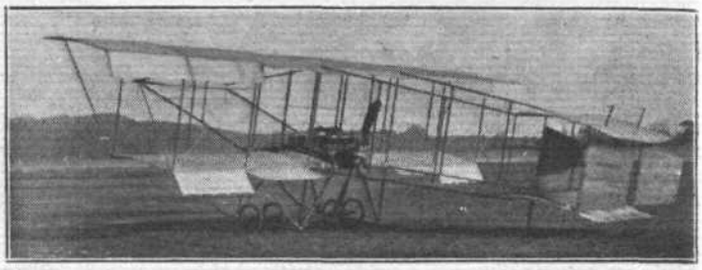
The other picture shows the other extreme, in the Santos Dumont "Demoiselle" of 1910, a tiny "low-pilot" monoplane of only a little over 16 ft. span. It flew somewhat erratically and was apparently a handful for its pilot.

Above, we show two interesting "experiments" hailing from Brooklands of the 1910 period. That on the left is the Macfie biplane. As will be seen it was of the Farman type, and was fitted with a 35 h.p. J.A.P. engine, although originally intended for a 60 h.p. engine of the same make. The other machine is the Hammond triplane, about which, unfortunately, we have very little record. Apart from being a triplane, its principal feature consisted of the twin tractor airscrews driven from the engine by belt transmission!

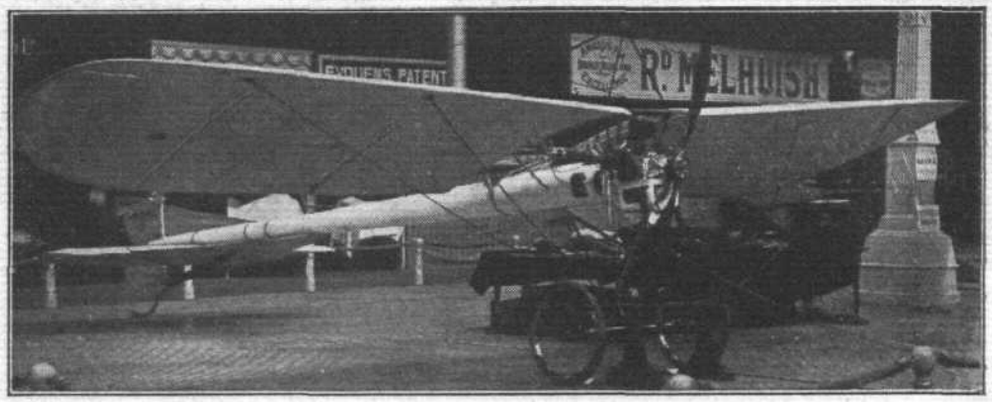
FLIGHT *Photos.*]

VARIETY IN IDEAS



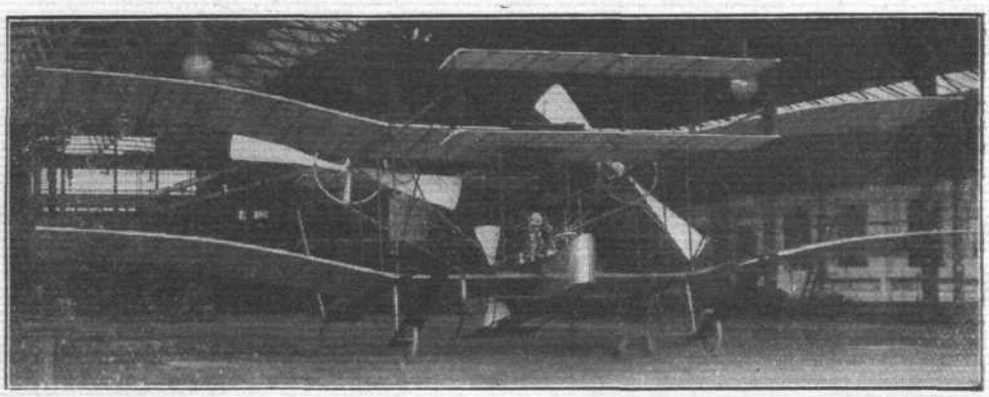


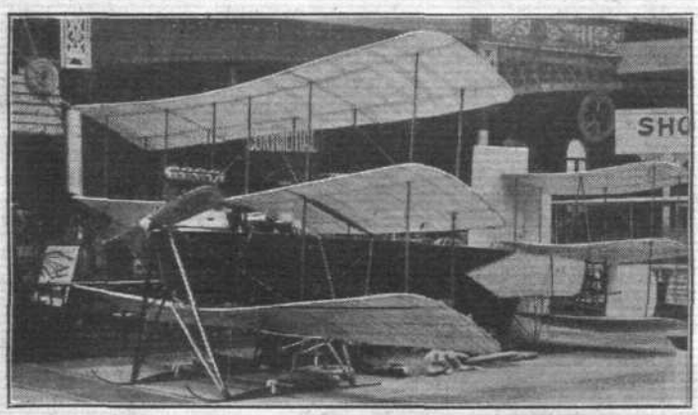
SOME more machines designed in 1910 are shown on this and the following page. The first machine illustrated is the Neal VII biplane, designed by J. V. Neal, who also was responsible for a Bleriot-type monoplane. In general design, the biplane was of the Farman type, but its main point of interest lay in the original system of control, which was evolved primarily to avoid the Wright patents. This was accomplished by means of vertical surfaces hinged at the leading edges to the outer front interplane struts and connected to the "joy-stick." These, in conjunction with the fore and aft elevators, steered as well as balanced the machine alone, and ailerons were unnecessary—those seen in the photograph being fitted as a precaution during trials.



The next machine illustrated is the Bristol biplane (Gnome engine) constructed by the British and Colonial Aeroplane Co., which eventually became the present Bristol Aeroplane and Motor Co. They were very similar to the Henry Farman, and large numbers were built and used for training purposes.

Next we see the Humber Bleriot-type monoplane, designed by Le Blon and exhibited at the 1910 Olympia Show. It had a hollow wood boom of tapering circular section for the fuselage, on which the pilot sat more-or-less astride!

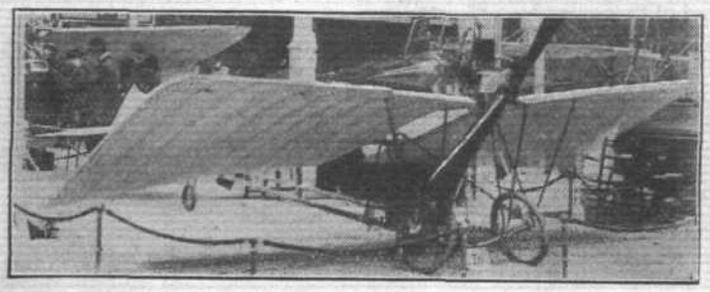




Our fourth illustration is the biplane designed by Sir Hiram Maxim, which possessed many novel features. Steel and duralumin entered very largely in its construction. It will be noticed that the main 'planes are in three sections, the two outer ones being arched and set at a pronounced dihedral angle. Biplane elevators were mounted fore and aft, carried from the main 'planes by tubular outriggers or spars, which actually extend the whole length of the machine and constitute the main members of the framework of the machine.

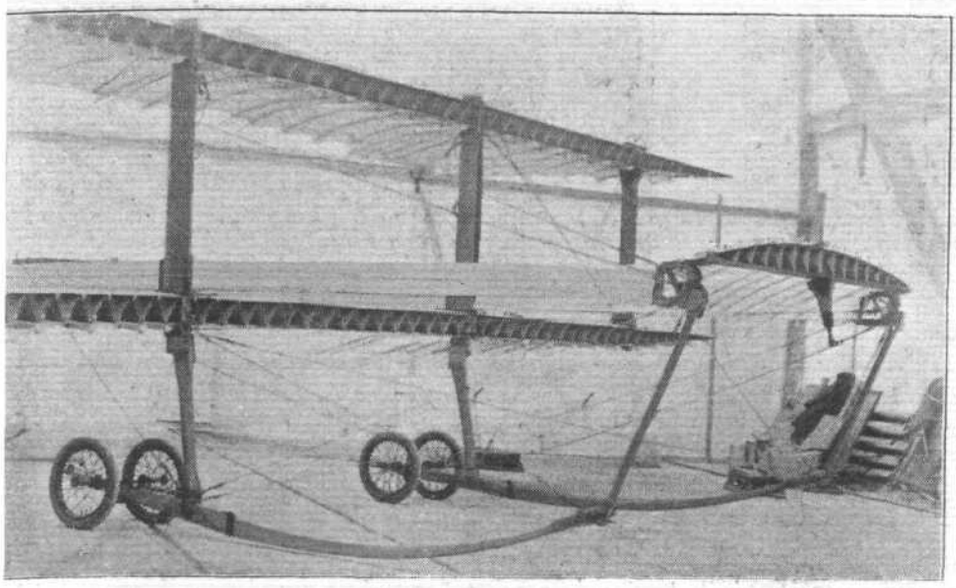
The Avro triplane "Mercury," shown on the left, was exhibited at the 1910 Olympia Aero Show, and may be described as being the original type, on which A. V. Roe had accomplished his initial efforts, thoroughly cleaned up and "modernised." It was fitted with a 35-h.p. Green engine.

The last two photographs show, on the left, the Mann and Overton monoplane, which was similar to the Santos-Dumont "Demoiselle," and, on the right, the "Avis" monoplane, constructed by Howard Wright for the Scottish Aeroplane Syndicate. It was flown by the Hon. Alan Boyle.



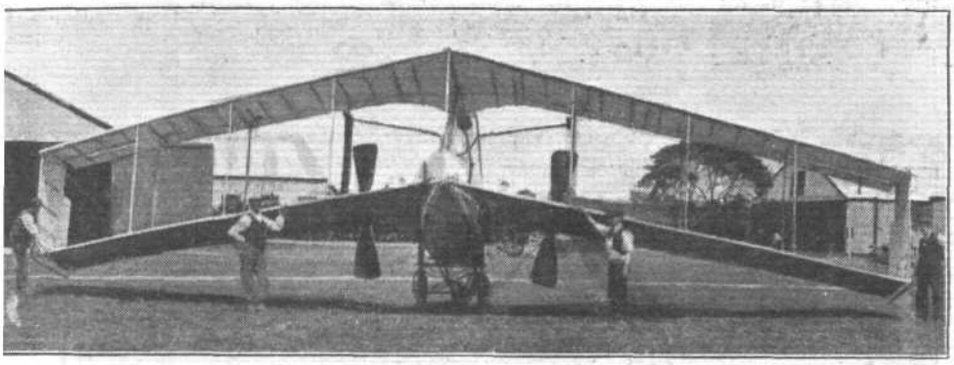
[FLIGHT *Photos.*

VARIETY IN IDEAS



TWO of the machines illustrated on this page embody extremely interesting ideas and depart radically from usual practice, not only of their period—1910—but of the present time. The first is the Louis Paulhan's *machine à voler*, a biplane fitted with a Gnome engine. Its most striking feature was the method employed in the construction of the framework and wings. It had a forward elevator and stabilising tail plane, with the main planes midway between. The angle of incidence of the outer sections of the main planes could be altered for purposes of lateral control.

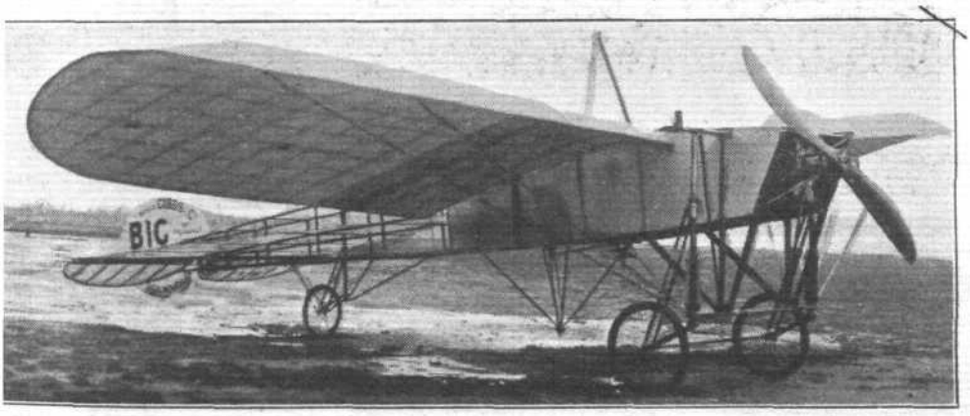
The entering edge consisted of a beam formed into a kind of latticework inserted between two strips of ash meeting at their extremities; the ribs were attached to the beams by detachable clips, and a canvas covering was spread over the ribs.

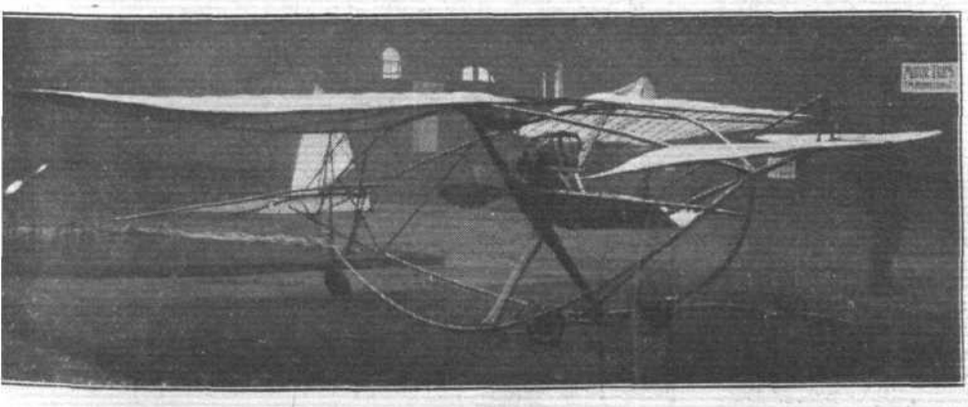


Our second subject is the Dunne biplane constructed by Short Bros. to the design of Lieut. J. W. Dunne, who had been experimenting with the principles involved for some time previously. The outstanding feature of the Dunne biplane was the arrangement of the main planes, which were in V-fashion viewed from above; that is, they sloped sharply backwards from the centre, where they joined the body, and their extremities lay a little behind the rear of the body.

The machine had no tail, but the wings were "twisted" in such a manner that the angle of incidence at the tips was less than at the centre—or, in other words, the tips had a negative angle of incidence. This, together with the V-formation, gave the machine a most remarkable degree of automatic, or inherent, stability—an interesting fact which we fully explained in FLIGHT at the time.

The engine, a 50 h.p. Green, was mounted in the centre of the body and drove two propellers—located within the V—through chain transmission. Lieut. Dunne, and others, made many successful flights on this machine.



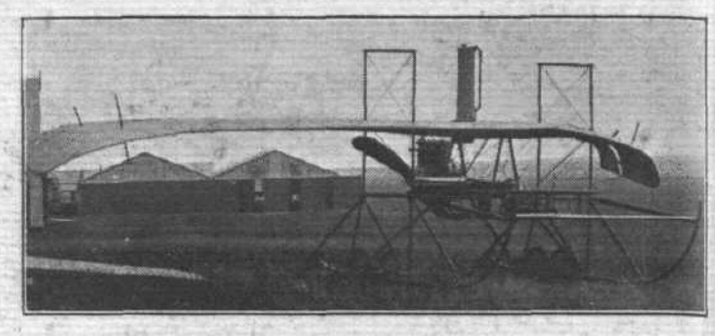


The third machine illustrated shows the two-seater Bleriot monoplane "Big Bat," fitted with a 50-h.p. Gnome, which was flown at Brooklands by Graham Gilmour in 1910.

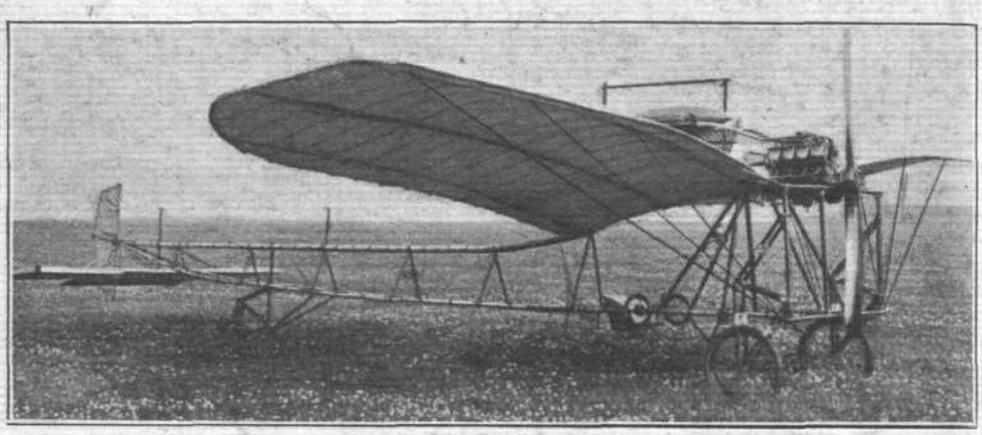
Finally, we show an interesting machine designed by Maj. Baden-Powell, and exhibited at the Stanley Show of 1910.

FLIGHT *Photos.*]

MORE TYPES



SOME more examples of early biplanes and monoplanes are shown here. The first is the Howard-Wright, a British-built version of the Sommer-Farman. It was on one of these machines, with E.N.V. engine, that T. O. M. Sopwith won the Baron de Forest Prize for the longest flight from England to the Continent, in December, 1910.

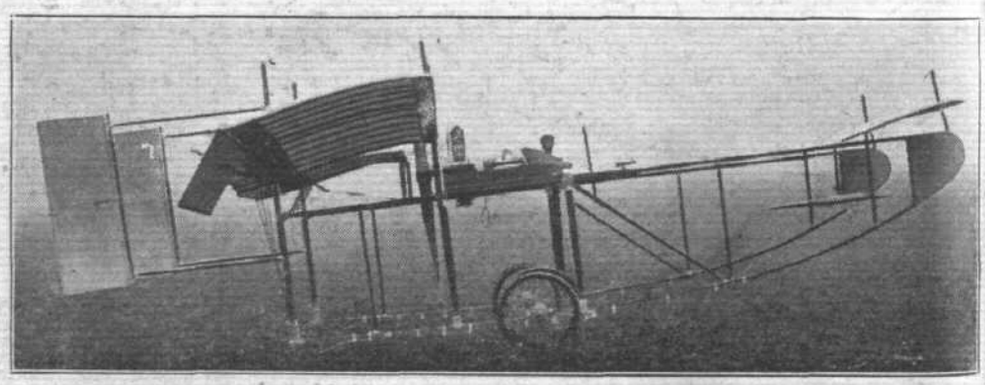


In the next photo we show the Dunne monoplane, which was built in 1911 and embodied, in modified form, the principles evolved by Lieut. Dunne, previously referred to.

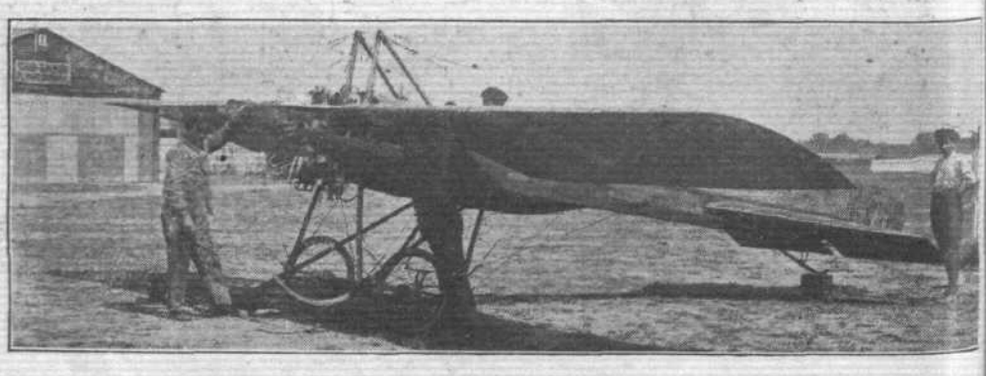
The Fritz monoplane, shown in the third photo, designed by Mr. Fritz Goetze, and constructed by Messrs. Oylers, Ltd., of London, in 1911, was practically an overgrown Santos Dumont "Demoiselle." It was constructed mainly of bamboo and was fitted with a 40 h.p. E.N.V. engine.

Round about 1910, A. V. Roe returned once more to Brooklands, where, backed by the experience gained from his early efforts, he constructed a number of successful machines. One of these, this time a biplane, of 1911, is shown in the fourth illustration, and it was from this that the famous 504 was developed.

A machine of somewhat unorthodox design was the "Valkyrie" tail-first monoplane—the 1911 racing model being shown here—designed by H. Barber and built at Hendon. The machine illustrated had a Gnome engine, but other models had Green engines. It will be noticed that there was no horizontal tail surface at the rear, only two vertical rudders. In front, however, there was a fixed horizontal plane, as well as an elevator.

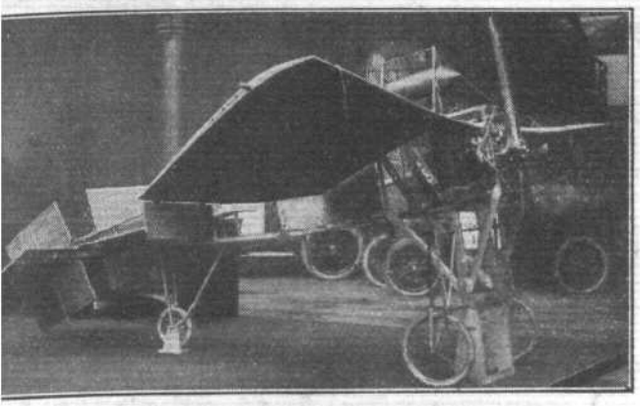


The last illustration is a typical example of the Deperdussin monoplane, as produced both in France and England in 1911. There were various models of this machine, for racing, school work, etc., both single or two-seaters, but all were on much the same lines.

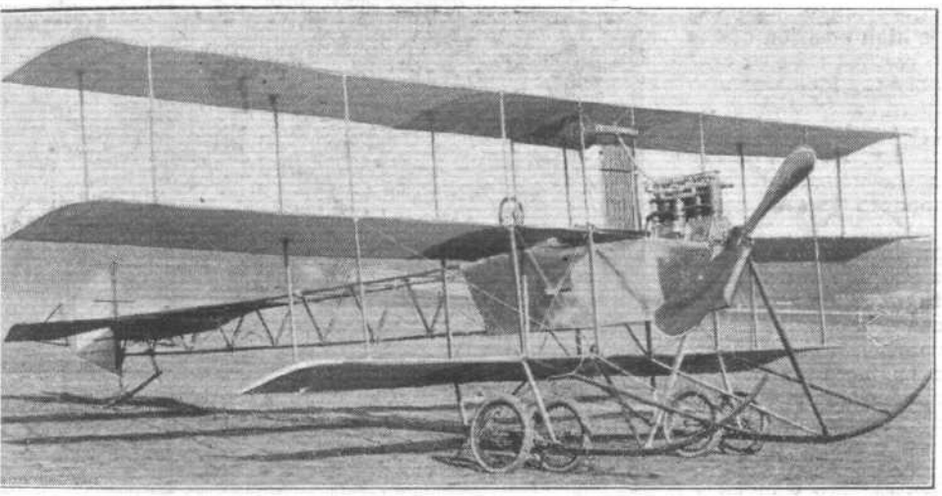


[FLIGHT *Photos.*

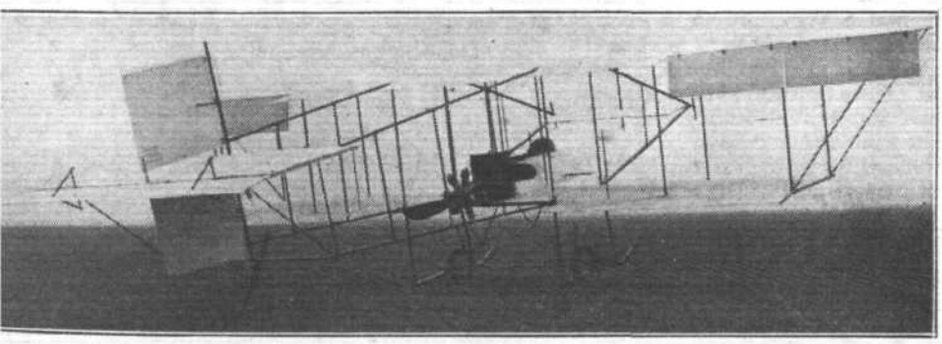
SERIO-COMIC.



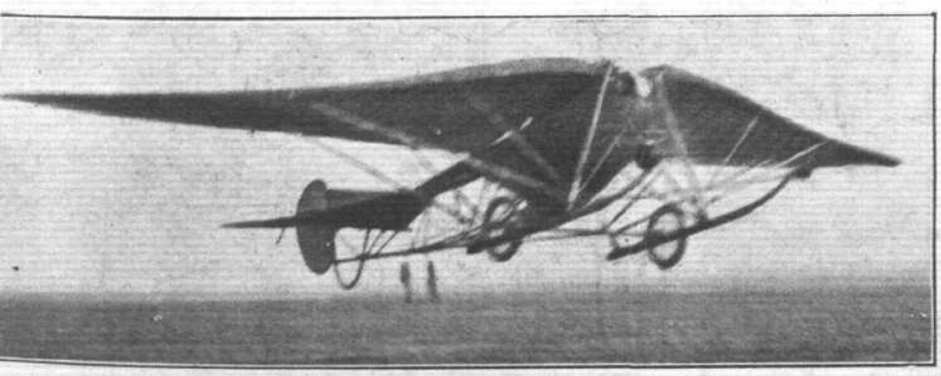
HE two illustrations at the top of this page are the comic ones! That on the left is a monoplane, bearing the name of "Steward." It was exhibited at the 1910 ley Show by the Scout Aero Club, and had a 20 h.p. ston engine. In 1912, W. T. Warren, a famous tenant endon, invented a safety helmet for airmen. Our picture he right shows him demonstrating its shock-absorbing ities to Lewis Turner, W. H. Ewen, and A. M. Ramsay.



The 1911 Roe triplane, built at Brooklands by A. V. Roe, is shown in the third illustration. As will be seen, it differs from the early models in many respects, mainly in the absence of the triplane tail. Fitted with a 35 h.p. Green engine, this machine flew well, and it was frequently seen in the air at Brooklands.



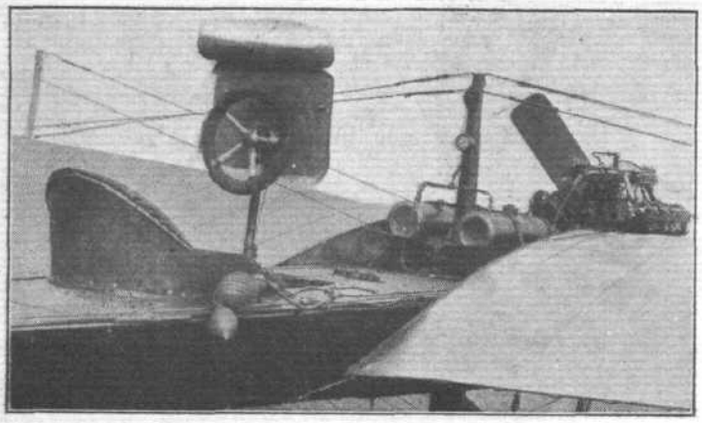
The Short "pusher" biplane, shown in the next photo, was built by Short Bros. in mid-1911. Although of the Farman type, it actually differed from it very considerably, as is clearly shown, especially as regards the tail, enclosed nacelle, and chassis. It was fitted with a 50 h.p. Gnome engine.

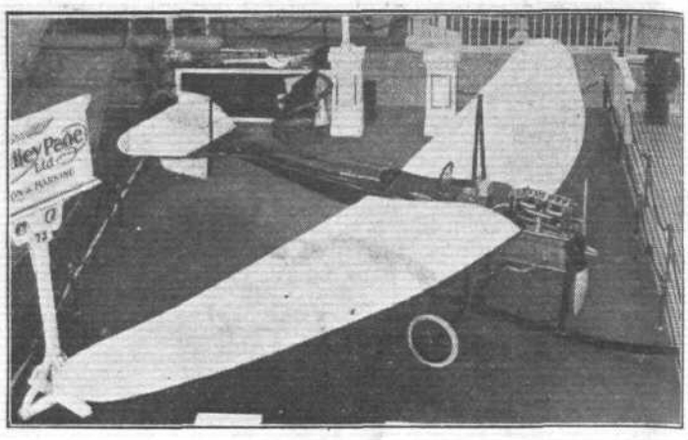


The Early—Pre-Twenty-One!—experiments of José Weiss, with his bird-like gliders, are well known. In 1910 a power-driven machine (40 h.p. E.N.V.) embodying his theories was built, and, piloted by Gordon England, several successful flights were made, mostly at Brooklands in 1911—one of these latter being depicted in our photo.

FLIGHT *Photos.*

SOME MONOPLANES





THERE appears to be a tendency among British aircraft designers of late to take up again a rather closer study of the monoplane type than has been the case during the last ten years or more. That being so, the photographs on this page are of interest in showing some early monoplanes of the 1911 period or so.

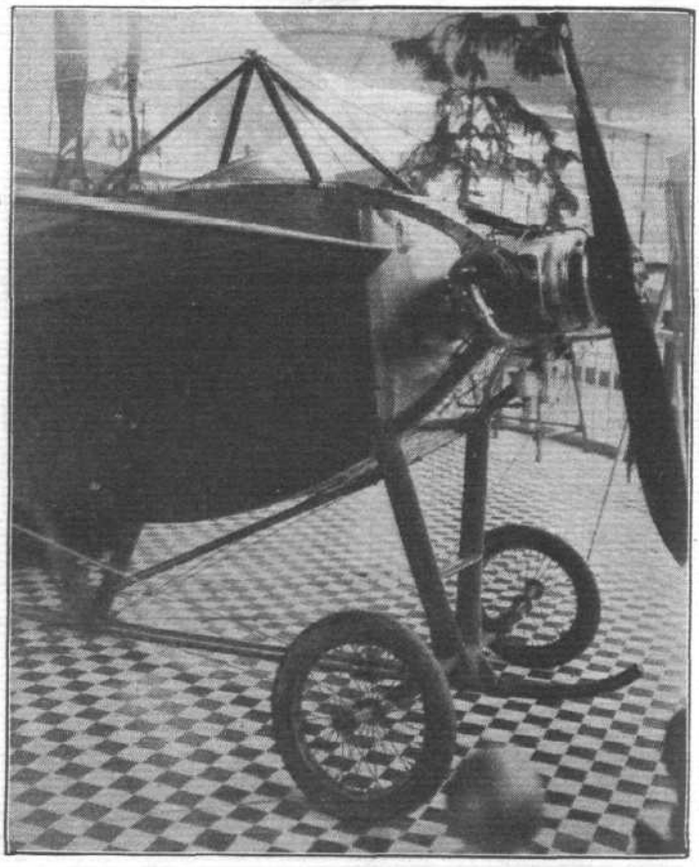
The photograph in the top left-hand corner shows the cockpit of an early Martin Handasyde monoplane. It will be noted that the cockpit is very shallow, the triangular-section fuselage being largely responsible for the high position of the seat. Mounting the windscreen on the control column now seems an unusual procedure, but probably the idea was also to relieve a certain amount of tail heaviness.

The Handley-Page monoplane shown in the top right-hand corner was designed for automatic stability, and for many years "H.P." was a great believer in the crescent-shaped wing. The wing-tips were given a pronounced "washo-out" in addition to their sweep-back.

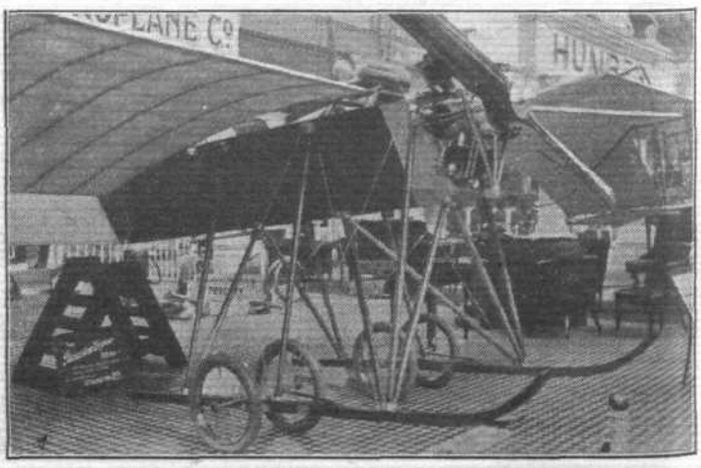
Of very efficient aerodynamic design, but always rather heavy structurally, were the little monoplanes produced in the early days by the Nieuport brothers of France. The photograph on the right shows an example exhibited at Olympia, where it attracted very favourable attention on account of its "clean" design. The engine used was a horizontal opposed water-cooled two-cylinder engine of some 30 h.p., and it is of interest to note that the performance was just about what one would expect of a modern machine with the same power and of approximately the same weight.

Among the younger FLIGHT readers there may well be a belief that the cabin machine is a modern, or comparatively modern, "invention." That this is not the case is brought out by the photograph below, of a monoplane exhibited by Piggot Brothers in 1911. The machine had a very "fat" fuselage, of streamline form, and the pilot obtained his view (such as it was) through windows in the fabric covering.

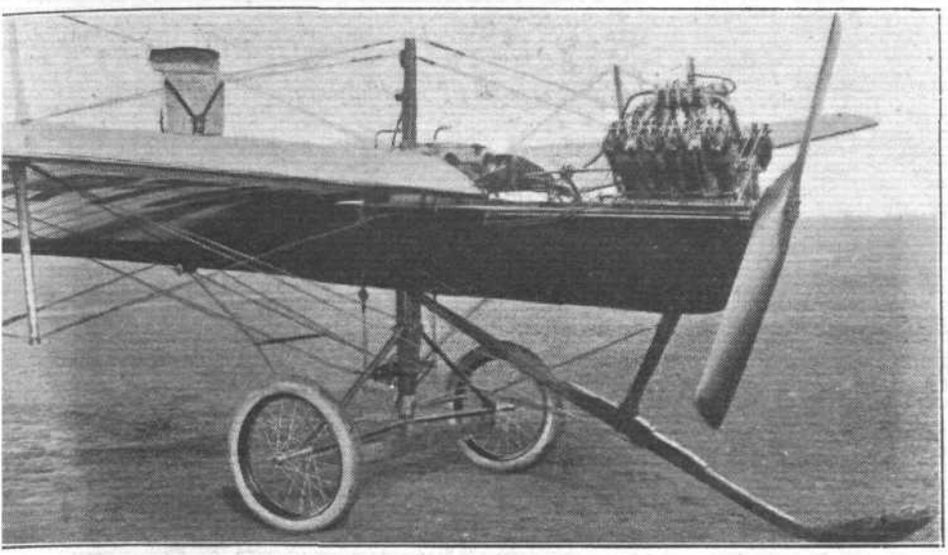
Among the pioneers of British aircraft constructors were the Blackburn Brothers, notably Mr. Robert Blackburn, and the photograph on the right shows the monoplane which he exhibited at Olympia in 1911. Like the Martin Handasyde monoplane, the Blackburn had a triangular-section fuselage, but the engine fitted was the first British radial air-cooled, the Isaacson. Looking at this early Blackburn monoplane one is struck by the very deeply-cambered aerofoils used, and by the liberal strutting in the undercarriage. Skids



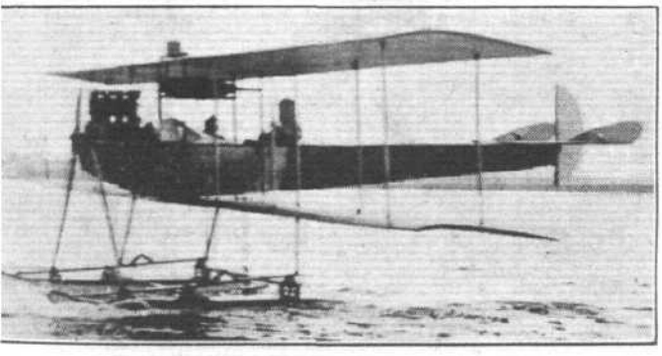
were used on nearly all early aircraft, sometimes a single central one, and sometimes, as in the Blackburn, two skids each carrying two wheels. It seems likely that a good many m.p.h. could be added merely by substituting a modern undercarriage to this machine, and such an experiment would be very interesting.

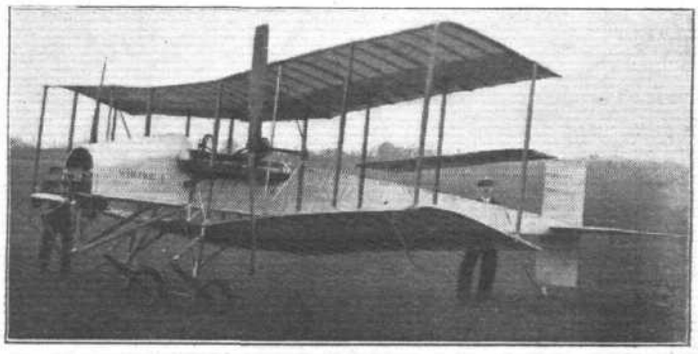


EARLY INGENUITY

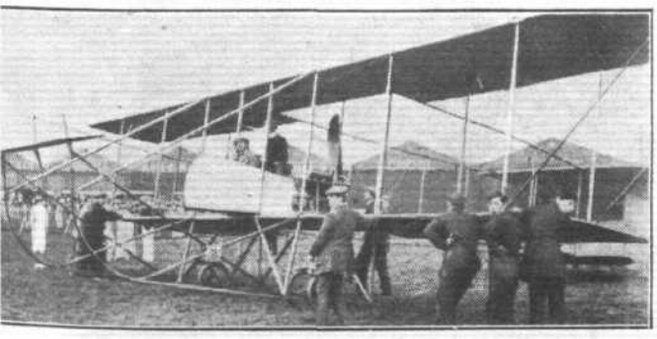


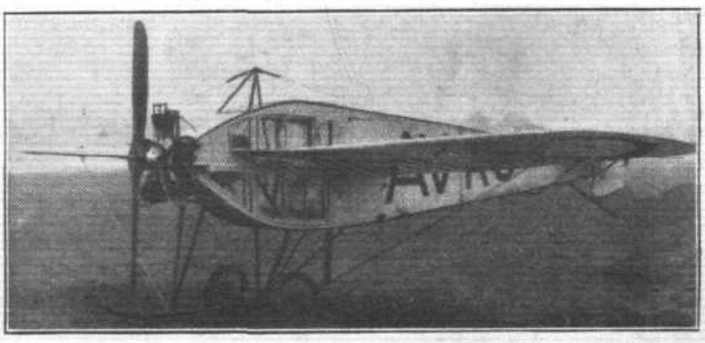
REFERENCE was made on the previous page to the 1911 type Martin Handasyde monoplane. A little more of this machine is shown in the upper photograph on the left. In this view the skid under the "nose," terminating in a "spoon" shoe, can be clearly seen, as well as the kingpost system of wing bracing employed. The earliest Martin Handasyde monoplanes, produced at Brooklands were strongly influenced in their design by the French Antoinette monoplanes, and the engine fitted in the machine illustrated, was in fact, an Antoinette water-cooled engine Actually it would be more correct to say that it was a steam-cooled engine, for the water in the jackets was permitted to boil, and the steam was condensed in large condensers mounted along the flat sides of the triangular-section fuselage. In view of the modern tendency to revert to evaporative cooling, it is interesting to recall that this was employed fairly successfully 19 years ago. The Star monoplane shown on the left was produced in 1911, and was chiefly remarkable for a feature which does not, unfortunately, show in the photograph. The two elevator flaps, of diamond shape, were independently operated to give lateral control. That they failed to do so is scarcely surprising nowadays.





The photographs above show two machines which, each in its own way, marked a milestone. On the left is Commander chwann's Avro, the first tractor seaplane to get off the water. In the photo, Sippe is in the cockpit. On the right Mr. Horatio Barber's "Viking," a 1912 single-engined twin-screw biplane.



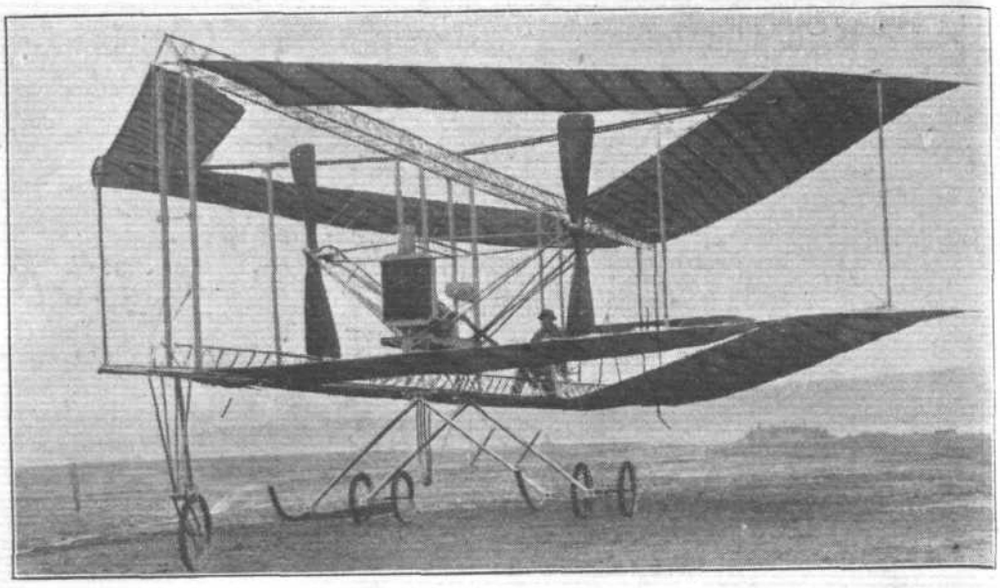


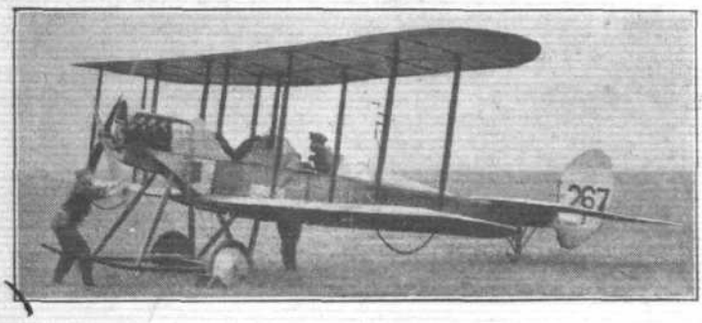
Of the two 1912 types shown above, that on the left is the famous Maurice Farman "Longhorn" with Grahame White the nacelle and Louis Noel standing by the wing. The machine on the right is the Avro enclosed cabin monoplane tted with Viale radial air-cooled engine.

FLIGHT *Photos.*

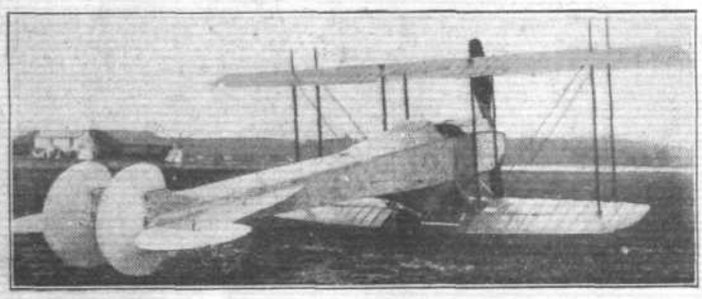
VARIETY

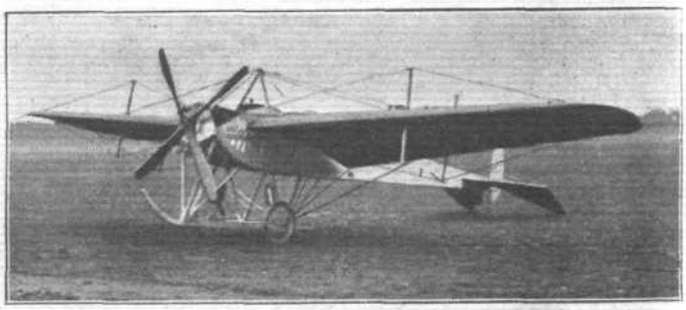
MANY were the ways and means tried in the early days to achieve automatic stability in the air. The "Circular" 'plane of Mr. Cedric Lee was one, and the Walton Edwards "Rhomboidal" machine shown on the right was another and not entirely dissimilar type. The "Rhomboidal" biplane did not, as far as we recollect, attain any marked degree of success, but whether this was due to the unorthodox design or to insufficient engine-power, or to ineffective controls, we cannot say. Any one of these would have been cause enough in itself to prevent success, and it is likely that all three causes contributed. Scale models in the form of gliders were made before the full-size machine was built, and flew remarkably well. It is regretted that we have not available a photograph of the Cedric Lee machine for comparison. The general principle was similar, but the plan form was circular, with an opening in the centre. Mr. Tilghman Richards had a good deal to do with the development of the Cedric Lee.



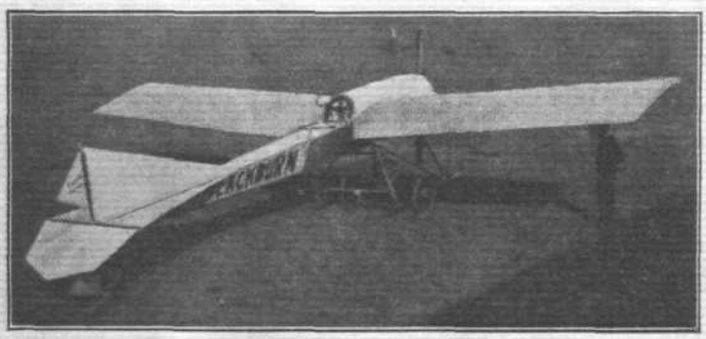


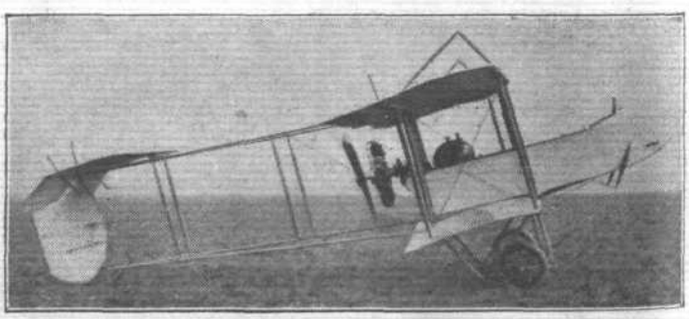
Designed at the Royal Aircraft Factory, Farnborough, the B.E.2A shown on the left was the forerunner of the B.E.2C, but had wing warping instead of ailerons for lateral control. The Vickers monoplane, No. 6, shown on the right, was influenced by French R.E.P. practice. The fuselage structure was of steel tube, although the machine was produced as early as 1911 or 1912.





The Coventry-Ordnance biplane, shown on the left, was designed by Mr. W. O. Manning for the Military Trials of 1912. The monoplane on the right was designed and built at Brooklands by Mr. L. Howard Flanders.



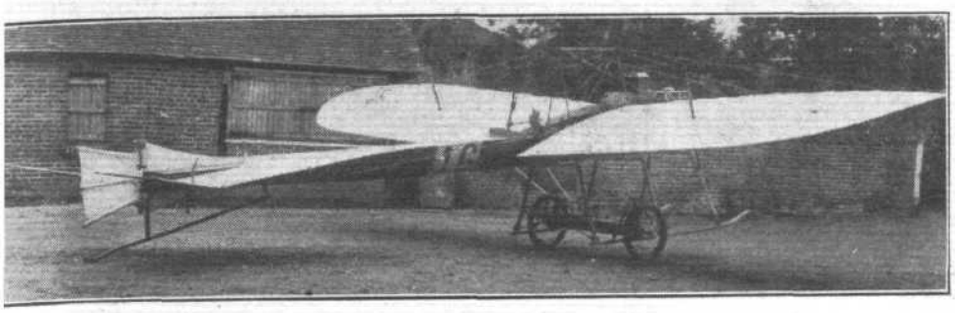


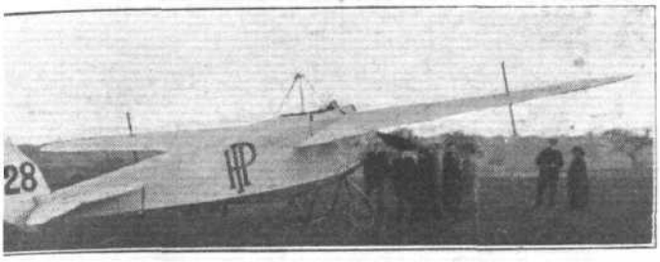
Reference has already been made to the early Blackburn monoplanes. The photograph on the left shows, from above, a 1912 model with 50 h.p. Gnome, in which a great deal of flying was done, notably by Mr. Harold Blackburn. On the right is the Henry Farman, which was a very familiar sight at Hendon during 1912-13-14. It was on a machine of this type that Chevillard did his famous "Chute de Cote," or side-slip stunt.

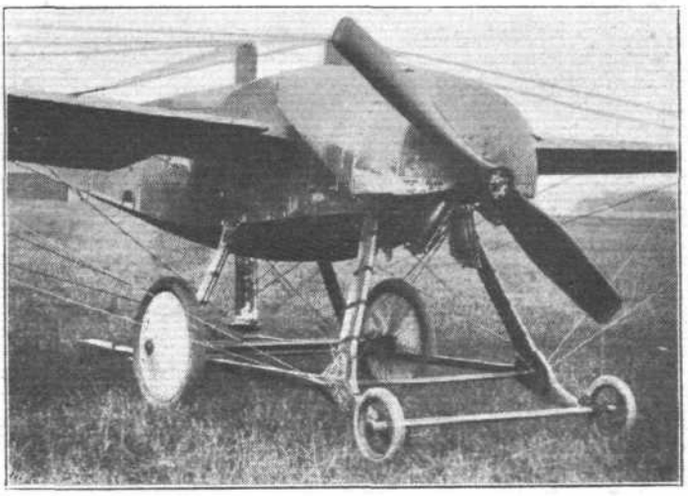
FLIGHT *Photos.*

MAINLY MONOPLANES

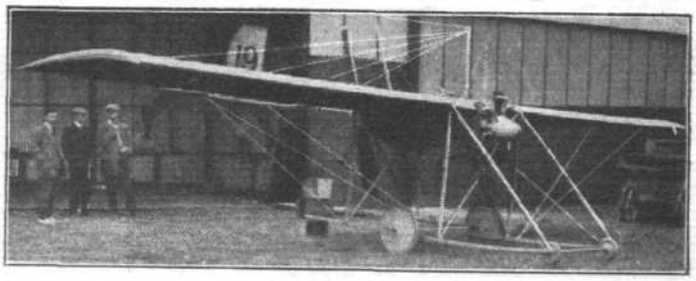
A Hanriot monoplane of French design, and affectionately known as "Henrietta," was much in evidence at Brooklands in 1912-13. It had a semi-circular section boat-built fuselage, and almost the whole of the pilot's body was exposed to the propeller slipstream. To modern ideas the rudder looks somewhat inadequate, but the tailplane was of ample dimensions. Lateral control was by wing warping. The machine did some very hard school work, and was, if we remember right, used by those early birds who styled themselves "*Bois Cassé Unlimited.*"







A Handley Page monoplane of 1912 is shown on the left, above. It had the crescent-shaped wings of its time, and was fitted with a 70 h.p. Gnome engine. Below is a Nieuport monoplane, also with Gnome engine, which differed little, except for the engine, from the Nieuport shown on page 44. On the right is one of the Coanda-designed Bristol monoplanes which took part in the Military Trials of 1912. This machine was of very clean design, but the top bracing wires were at a bad angle.

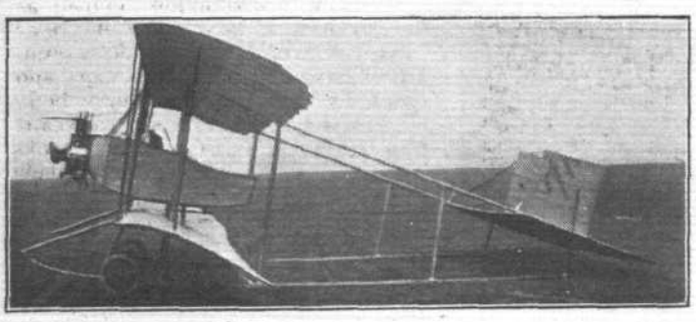


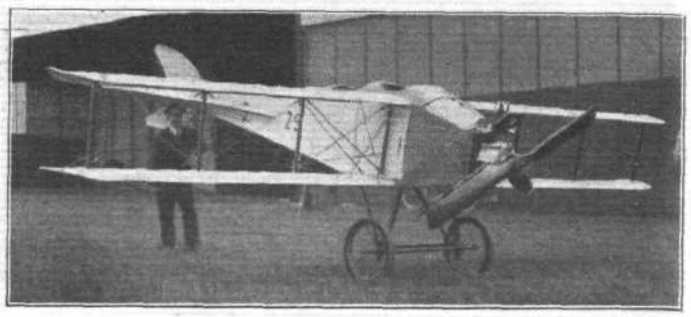
Ever unorthodox, Mr. Cody had his own ideas on aircraft design, and his monoplane of 1912 showed, among other features, a dart-shaped tail. The machine landed on a cow, with serious results to the latter. In the Military Trials of 1912 was the Mersey monoplane, designed and flown by Fenwick. Although the engine was in the nose the propeller was a pusher. The machine collapsed and killed its pilot.

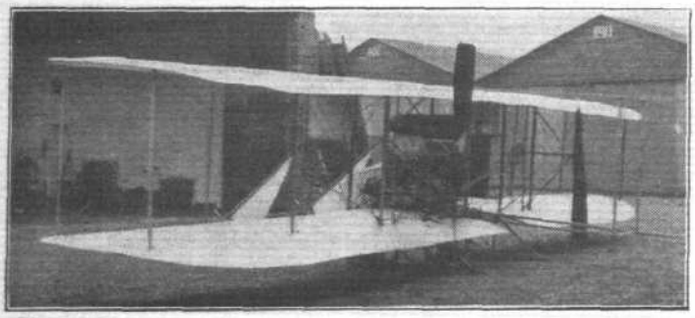
It does not require a great deal of imagination to trace in the photograph on the left the beginnings of the famous Avro 504. This biplane, with a Green engine, was produced in 1912, and was flown a lot by Mr. Raynham. In the photograph on the right the large top 'plane extensions of the Henry Farman are better shown than in the photograph of the machine on page 46. Note king post bracing on top.

FLIGHT *Photos*,

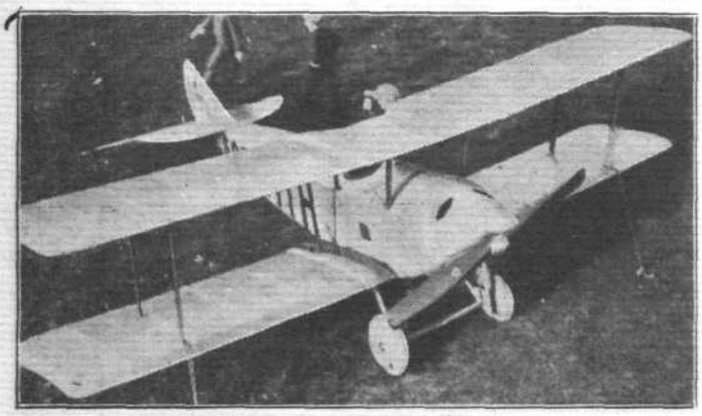
LIGHT 'PLANES AND OTHERS



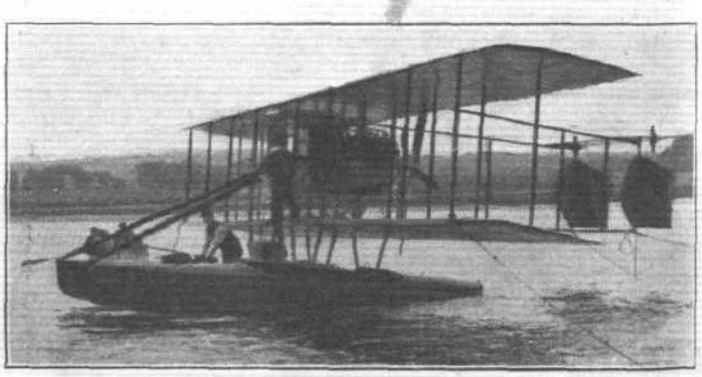




These four machines from 1912 might, perhaps, be termed early light 'planes, as they had engines of 25-50 h.p. The machine in the top left-hand corner is a Caudron with 35 h.p. "Anzani," while in the right-hand corner is a little Piggot biplane with the same engine. Below on the left is the Sopwith Wright on which Hawker won the Michelin Cup by remaining aloft for more than eight hours. On the right, a Handley Page 50 h.p. monoplane, which did a great deal of flying at Hendon.



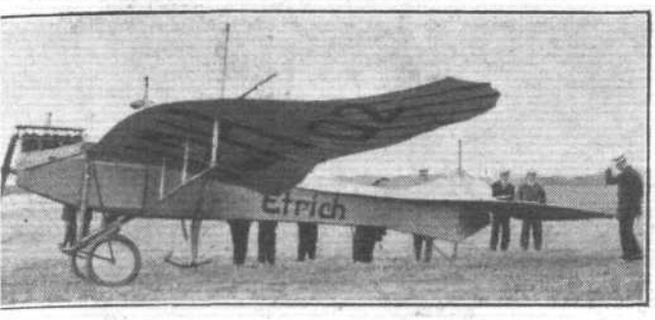
The foundation of the greatness of the House of Sopwith may be said to have been laid with the "Tabloid" biplane shown on the left, which was the forerunner of the Schneider Trophy winner and of the "Pup" and "Camel." The Breguet on the right was of all-metal construction, and had but a single tubular wing spar.

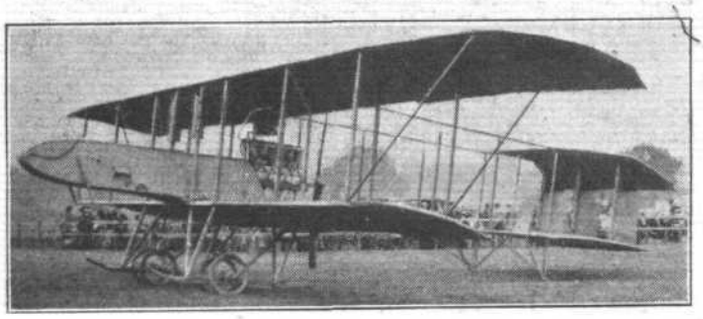


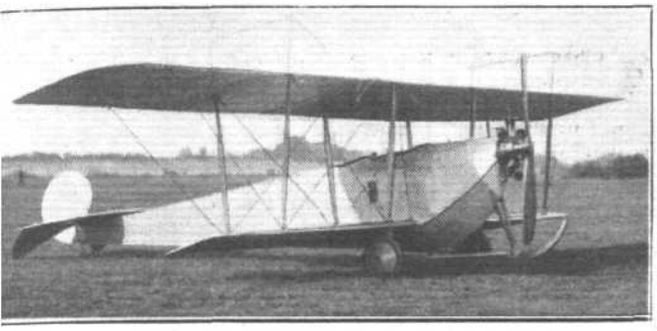
In these days of highly-efficient training machines the Grahame-White "School 'Bus" of 1912–13 or so, shown on the left, forms rather a striking contrast. The machine on the right was built for the "Circuit of Britain," and was remarkable for the fact that the occupants sat in the floats, which were *clinker built*. It was designed by Gordon England.

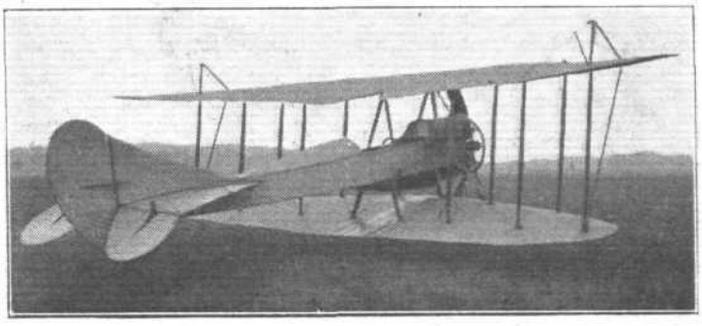
FLIGHT *Photos*

SOME EARLY MILESTONES









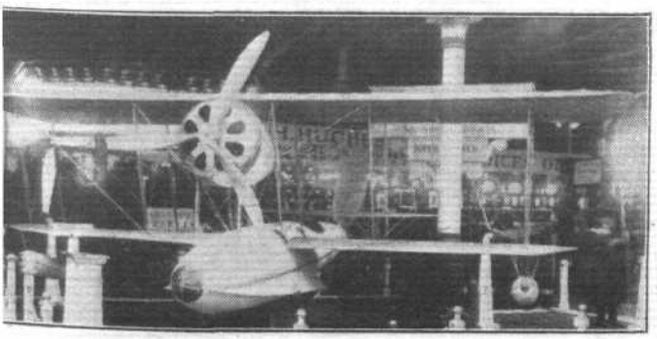
Among the earliest types of aeroplane to be produced in Germany was the "Taube," one of which is seen in the top left-hand corner. It is reported that Herr Etrich has designed a new "Taube" light 'plane. On the right is the once-famous Grahame White "Charabancs," designed by Mr. North. Although fitted with a Green engine of 100 h.p. only, it once flew from Hendon to Brooklands with 11 people on board. The Howard Flanders biplane, Isaacson engine, is shown below on the left, and the Handley Page biplane on the right. This machine had the same type of crescent-shaped wings as the earlier L.P. monoplanes, and the machine was actually flown without a tail, *i.e.*, without a horizontal tail plane. The wing design was such that the machine could, apart from the need for rudders, have been made into a "tailless" type. The machine did a lot of flying, piloted first by Mr. Whitehouse and afterwards by the late Mr. Ding.

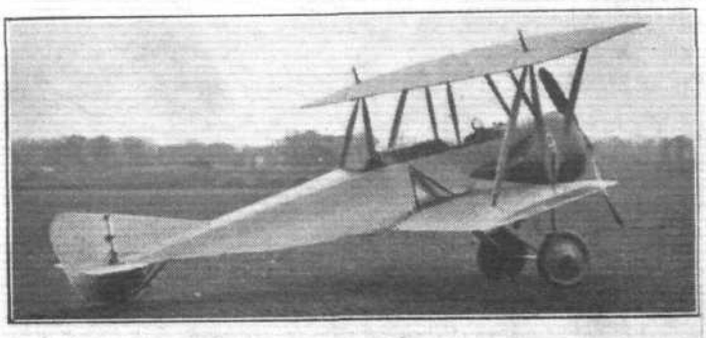
Although several years before its time, the flying boat exhibited by Mr. Pemberton Billing at Olympia in 1914 was undoubtedly the forerunner of the modern Supermarine flying boats. The actual machine was not a success, but all the essential features were there, and only needed proper combining.

Of the photographs on the right, the upper shows a two-seater Bleriot monoplane of 1913 which was extremely popular in its time, and was flown a lot by such famous pilots as Hamel, Hucks and Brock. The tail skid, placed far forward on the fuselage, acted as a fairly effective brake. The positively-cambered tail plane and negatively-cambered elevator feature was retained in this machine, but never afterwards.

Before the advent of the famous Avro 504, several Avro biplanes were produced which all tended towards that type. The machine shown centrally on the right was one such type, of 1913 vintage. Like the later 504 it had a Gnome engine, but the nose was of different shape and the horizontal top longerons had not yet disappeared.

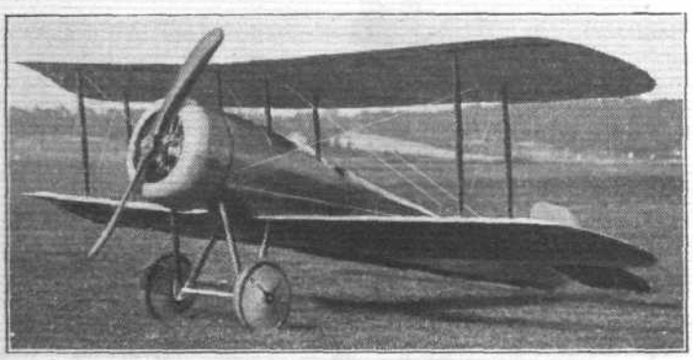
Although it was never put into production, the machine shown in the bottom right-hand corner was one of considerable interest. Designed by Mr. J. D. North and built by the Grahame White Aviation Co. of Hendon, this early scout (1914) showed features which do not look out of the way even to-day. Note, for example, the very pronounced dagger, which was an unusual feature in those days. In spite of its small size the machine was a two-seater. It was also tested as a seaplane.

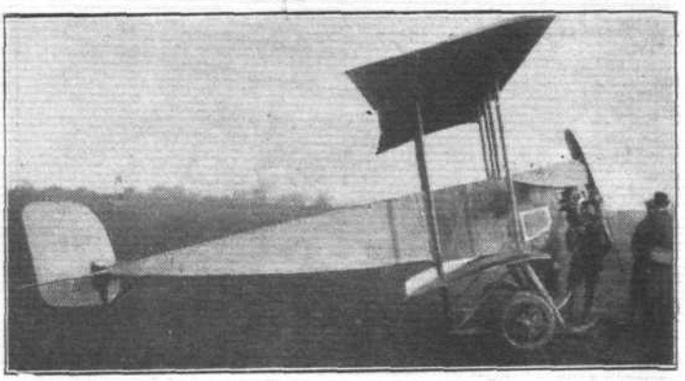




FLIGHT *Photos.*

HETEROGENEITY





A SOMEWHAT heterogeneous collection of photographs is shown on this page, the machines having only this in common that they were produced either during the period immediately before the war or during the early part of the war years. Referring to the photographs in the left-hand column, that at the top shows the Perry-Beadle flying boat exhibited at Olympia in 1914. The hull was, if we are not mistaken, built by S. E. Saunders, of Cowes, and was of very beautiful construction. The lower wing was planked with Saunders "Consuta," the machine being designed without outboard floats, and the idea being that the lower wing should act to steady the machine on the water. In spite of low engine power and consequent heavy power loading, the machine did actually get off the water, but it never became a success. Something of the same idea was incorporated a few years ago by Mr. W. O. Manning in the English Electric Co.'s "Ayr" flying boat, in which also the lower wing was partly submerged when the machine was at rest on the water.

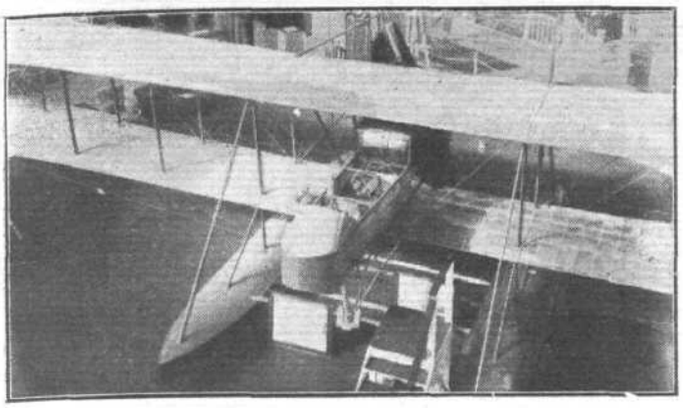
The first Avro 504 made its public appearance at Hendon in 1914, and won instant admiration. We recollect that on the day of its visit it was flown in turn by a number of pilots, and they all expressed themselves delighted with it. Among those who flew it was the late Mr. Gordon Bell.

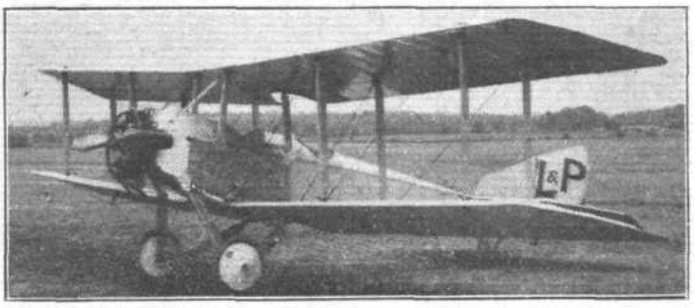
Next comes the little Bristol scout, the first of which was shown at Olympia in 1914, and on which later Harry Busteed made a flight in record time from Netheravon to Brooklands. As the Bristol "Bullet," the type later took part in the war. And this reminds us that in this review of the past we can devote but little space to the war period. For one thing, most readers will remember the more important war types. Secondly, we desired that all the photographs in this section of our Birthday Number should be FLIGHT's own, and during the war we were not permitted to photograph aircraft.

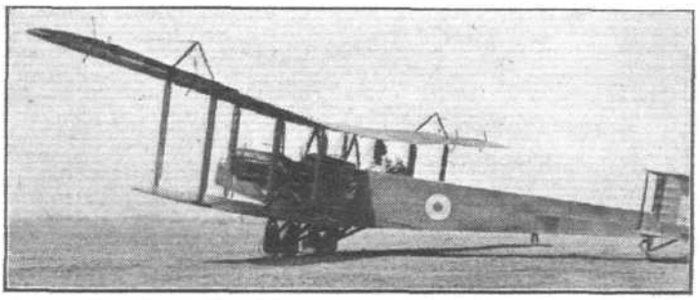
The close-up of the Mann and Grimmer biplane illustrates the unusual arrangement of the airscrews. There were two of these, mounted as "pushers" aft of the wings, and they were chain-driven from a 100 h.p. Anzani engine mounted in the nose of the fuselage. Not unlike Horatio Barber's "Viking" in a general way, the Mann and Grimmer machine did quite a lot of flying, having the advantage of more power than was available to Mr. Barber. On one occasion one of the driving chains broke, but Mr. Rowland Ding, who was flying the machine at the time, managed to land safely.

The machine in the bottom left-hand corner is generally and officially known as the D.H.1. That is merely a designation of the first machine designed by Geoffrey de Havilland for the Aircraft Manufacturing Co. The real D.H.1 was a very different affair, produced several years earlier, and having flaps in front and flaps behind as well as on the sides. Perhaps Capt. de Havilland can be persuaded later to send us a photo. of the real D.H.1? We remember being present when Capt. de Havilland made the first test flight on the official D.H.1. Without any preliminary "straights" he took it into the air, and at once commenced to circle, thus showing his confidence in the machine. He was, and is, one of the most remarkable examples which has come to our notice of the successful aircraft designer who is also a good pilot.

At the top of the column is the Grahame White machine "Lizzie," on which many pilots had their first experience of looping. The machine was ultimately bought by a man who had never flown, but who took "Lizzie" for a flight and turned her upside down on landing, but with amazingly little damage. FLIGHT *Photos.*







THE photographs at the top and bottom of this column show two machines which were rather remarkable each in its own way. The machine at the top is the pusher seaplane designed by Howard-Wright while chief designer to Samuel White of Cowes. Superficially the machine does not look very unusual, but it had an extraordinary wing profile in which the bottom camber was normal, but the top surface was "double-cambered," *i.e.*, was pinched inwards at about mid-chord. Wind tunnel tests indicated the wing to be very efficient, and Howard-Wright applied the same principle to the airscrew. Whether there really was "anything in it," is, perhaps, now open to doubt, but at the time the invention caused quite a stir.

The little machine at the bottom of the column is the Austin "Whippet," designed by John Kenworthy and produced in 1919. This machine was the first post-war light 'plane, but it was, unfortunately, before its time, there was then no demand for such a machine, and it never went into quantity production. We believe the machine is still in existence, or was until quite recently.

In the column on the right, the machine at the top is the biplane designed by "Tony" Fletcher for the L. & P. School at Hendon during the war. The machine might be claimed as a light 'plane, as the engine was a 60 h.p. Anzani and a passenger was carried in addition to the pilot. Among its achievements may be recalled the establishment of a record for consecutive loops, piloted by the late Mr. Smiles.

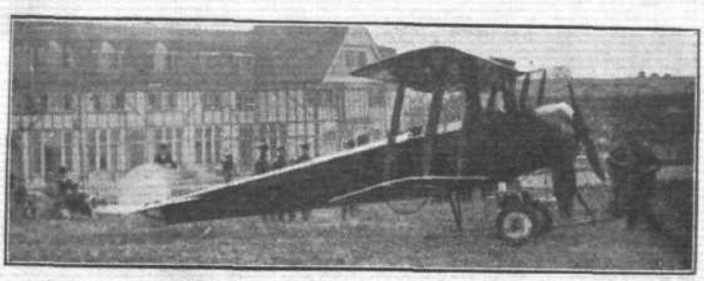
The next photo recalls the war period, and shows one of the Handley Page 0/400 bombers with Rolls-Royce "Eagle" engines. This type was to have been used for bombing Berlin, but the Armistice intervened.

The little monoplane which follows is a "Bristol," and was flown in several races after the war, winning one of them (Aerial Derby) piloted by the late Larry Carter. The almost totally enclosed rotary engine is an interesting feature.

In the photograph of the Boulton & Paul "Bourges" which comes next, one may without stretching one's imagination too greatly see the forerunner of the modern "Sidestrand." Its first claim to publicity was the stunt flying at Hendon in the hands of Frank Courtney.

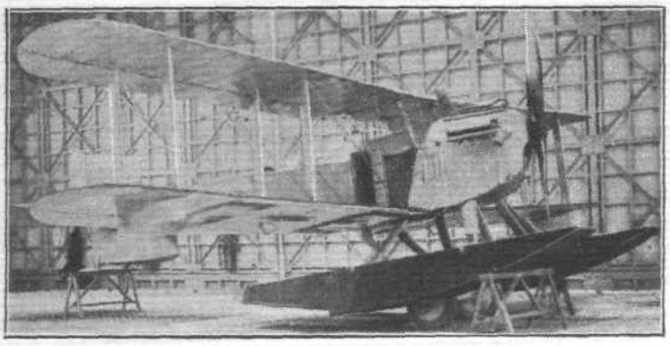
The little Bat "Bantam" which follows was designed by Frederick Koolhoven, and was used until comparatively recently for scientific tests of spinning.

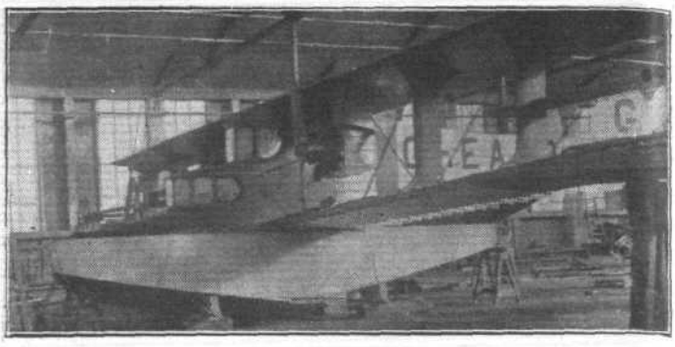
Finally, the bottom picture shows the post-war Avro 504, which was for years a familiar sight and which is only now being superseded as a training machine.

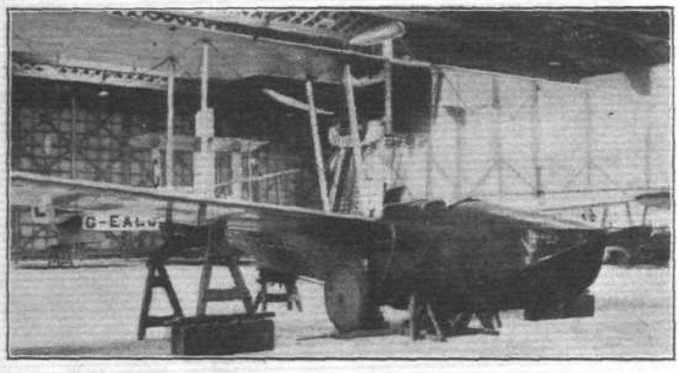


FLIGHT *Photos.*

AIR MINISTRY COMPETITIONS

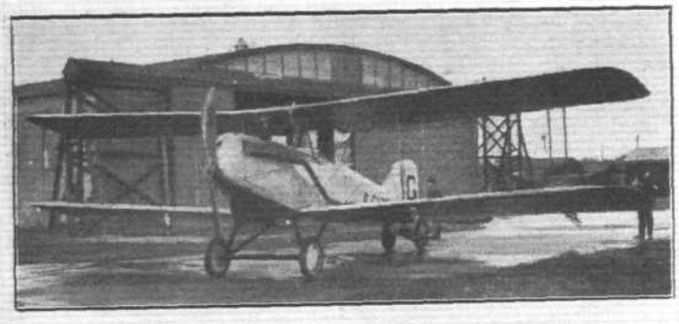


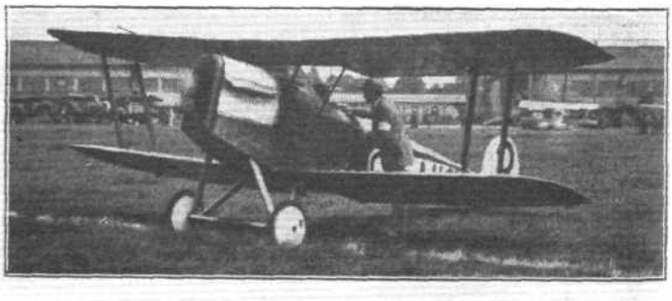


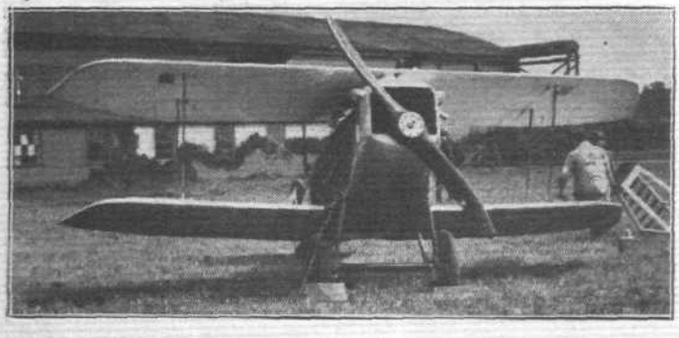


IN 1920 a competition for amphibian machines was held by the Air Ministry at Martlesham and Felixstowe, and the photographs on this page show some of the competing machines. Above is the Saunders "Kittiwake," which was not finished in time, and on the left, from above, the Fairey seaplane amphibian machine, the Supermarine amphibian flying boat, and the Vickers "Viking." Neither of the machines ever became really popular in their Martlesham form, although the "Viking" was later built in several versions and some few were sold abroad. The "Viking" also had the distinction of being the first machine to alight on the Thames, taxi up to the hard at Doultons and there run ashore on its wheels and dis-emplaning its passengers. The "Kittiwake" had "Consuta" covered hull and wings, and had variable camber gear in which both leading and trailing edges could be operated.

An Air Ministry competition for commercial landplanes was also held in 1920, and the photograph below the "Viking" shows the Austin "Kestrel." This competition was won by a Westland limousine, in which wheel brakes were fitted so as to enable the machine to pull up quickly. In the large class of commercial machine the winner was the Handley Page W.8 with two Napier "Lion" engines.





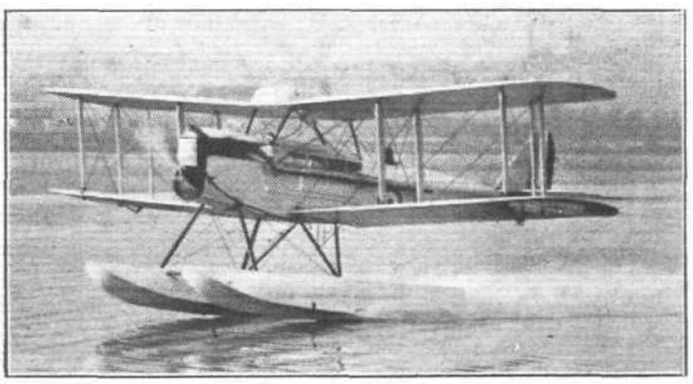


The photograph on the left shows the little Martinsyde "Semiquaver" with which Frank Courtney won the Aerial Derby in 1920, and with which he turned somersault in landing. On the right the upper illustration is interesting in showing the Avro "Baby" (35 h.p. Green engine) similar to the machine on which later Bert Hinkler flew non-stop from London to Turin, and afterwards made some noteworthy flights in Australia. The lower photograph shows the first D.H.9 to be fitted with Handley Page wing slots. The photograph was taken on the occasion of a demonstration at Cricklewood. The slots were of the operated type and used for lift rather than control.

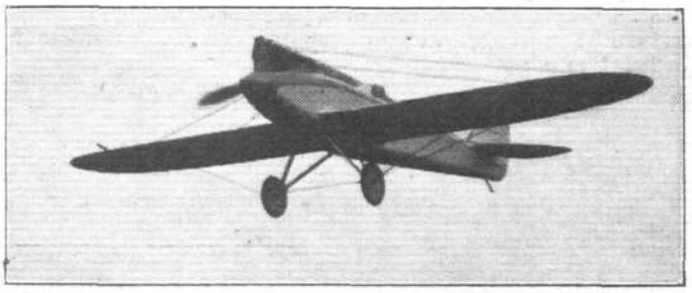
FLIGHT *Photos.*

OF the photographs on the right, that at the top shows the Vickers "Vulture" (a development of the "Viking") on which Squadron Leader MacLaren attempted a flight around the world in 1924. The fact that the machine was an amphibian was thought to count greatly in its favour for such a flight, as the machine was not restricted to the use of one or other element but could make use of both as occasion demanded. The flight did not succeed, but at least the machine showed considerable merits, and it seems a pity that the amphibian has now been dropped entirely.

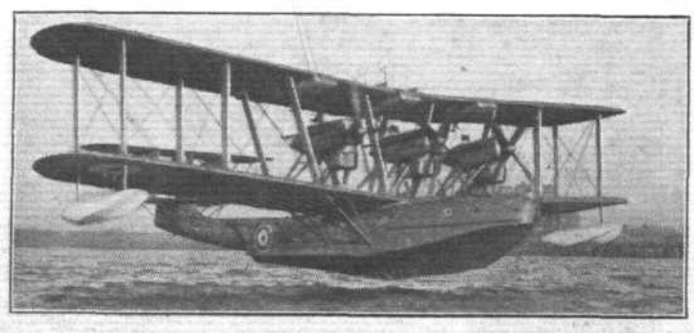
The next photograph shows a machine which, although it did not go into production, was a most interesting experimental type. It is the Blackburn "Cubaroo," and was fitted with the 1,000-h.p. Napier "Cub" engine, at that time (1926) the highest-powered aero engine in the world. The "Cub" had its cylinders arranged in the form of an unsymmetrical X.



The de Havilland D.H. 50 was originally produced as a landplane, and with a "Puma" engine was a very efficient little commercial machine. It was later converted into a seaplane, and in this form also was a most useful type, although the weight of the floats slightly reduced its pay load. The actual machine shown on the right was built for Australia, Short Brothers of Rochester making the floats, and was intended for use by Lord Stonehaven, Governor-General of the Commonwealth of Australia. It was, it may be recollected, on a very similar machine that Sir Alan Cobham made so many of his famous flights. For instance, the flight to India with Sir Sefton Brancker as passenger was made with the 50 as a landplane, and with the "Puma" engine. A "Jaguar" was then fitted, and Cobham flew the machine to the Cape and back, still as a landplane. Finally Sir Alan had floats put on, and flew to Australia and back. The particular machine carried the registration letters G-EBFO, and is now historic. Moreover, it is still in service in Australia.



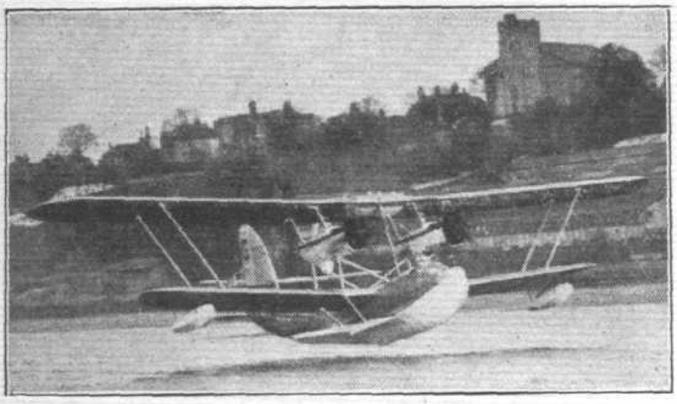
Another de Havilland machine, but of very different type, is the little "Tiger Moth." In this was fitted the first of the engines which later became the "Gipsy," and a world's speed record for the light 'plane class of 185 m.p.h. was established, with the engine developing only 130 h.p. It is noteworthy that in its general conception the "Tiger Moth" is not unlike the Schneider Trophy machines, and for its power it has a commensurate performance, which is another way of saying that it has the same low minimum drag coefficient.



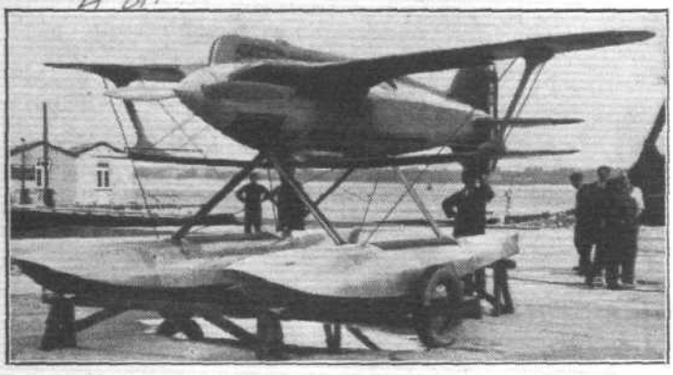
After being sadly neglected for a period of years, the seaplane type of machine came into its own a few years after the war, and Great Britain now produces unquestionably the finest seaplanes in the world, be they racing machines or heavy flying boats. Of the photographs above that on the left shows the Short "Crusader" (with Bristol racing "Mercury" engine) designed by Mr. Carter as a Schneider Trophy machine. The crossing of the aileron cables caused the machine to crash at Venice before it had a chance to show what it could do. On the right is a Blackburn "Iris" (three Rolls-Royce "Condor" engines), a type which has many long cruises to its credit and which is among the finest flying boats in the world.

FLIGHT *Photos.*

SEAPLANES



4811



ON the left is a photograph of the Short "Singapore" flying boat (two Rolls-Royce "Condor" engines) on which Sir Alan Cobham made his flight around Africa. It may be recollected that while at moorings at Malta the machine was badly damaged by the very rough seas and the gale, and that some delay in the flight resulted. Owing to the very simple type of metal construction employed by Short Brothers, however, the repairs were carried out in a much shorter time than would have been required to repair a wooden flying boat, and Sir Alan was able to proceed on his way and complete his difficult flight.

The flight served a number of purposes, apart from the immediate objects of surveying sections of Africa for the possibility of establishing regular air routes. The technical lessons learnt were many, and these are being applied in later Short machines with good results. The "Singapore" exhibited at the Olympia Show last summer indicated some of the improvements made as a result of Sir Alan Cobham's flight, and others are being incorporated in a still later machine now under construction, but about which nothing may be said at the moment beyond the fact that the number of engines is being increased and a more modern type of engine than the "Condor" installed.

The next photograph shows the Gloster-Napier IV Schneider racer of 1927. This machine, it will be recollected, suffered from engine trouble in the 1927 Schneider Contest, and it thus failed to complete the course, but for all that it may be said to represent a high-water mark in racing biplane design. It will be remembered that for his 1929 machine Mr. Folland chose the monoplane type. The Gloster-Napier IV and the Supermarine S.5 were used as training machines for the 1929 race, and one S.5 competed in the contest and completed the course, piloted by Flight-Lieut. d'Arcy Greig.

4816

On the right is shown the Supermarine S.5 (Napier "Lion") on which Flight-Lieut. Webster won the Schneider Contest at Venice in 1927 at an average speed of 281·7 m.p.h. A machine of the same type, but fitted with a newer type engine, flew in the 1929 Schneider, average speed 282·1 m.p.h.

5845

The D.H. type 61 was originally known as the "Canberra" from the first one, which was sold to Australia. A more recent version has been given "Giant Moth" as its class name, and it was on one of these that last summer Sir Alan Cobham did his great tour of Britain. That machine had been christened "Youth of Britain." The photograph above shows a D.H.61 sold to Canada undergoing tests on the Medway at Rochester.

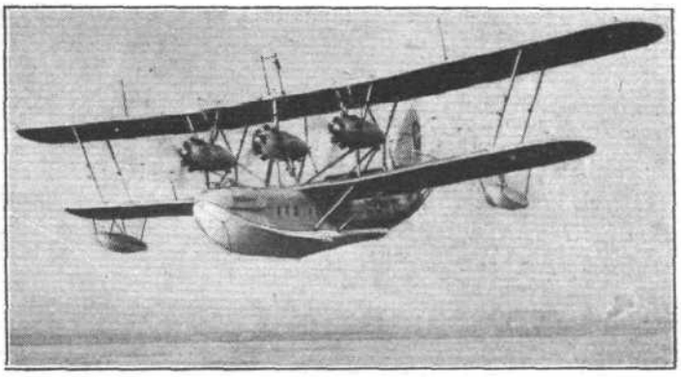
FLIGHT *Photos.*

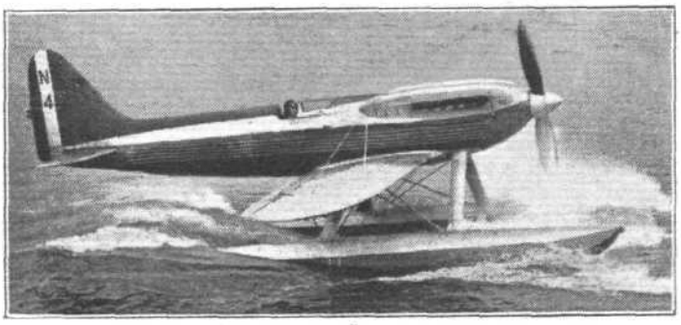
EXTREME

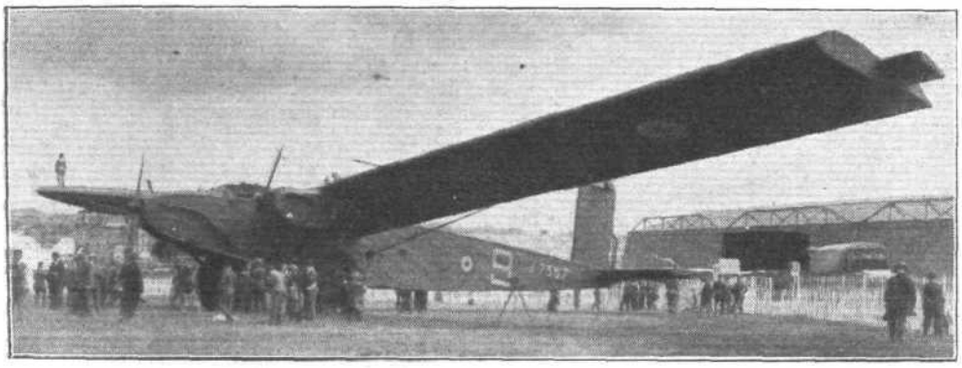
ALTHOUGH rather late in making a start with the development of the seaplane, Great Britain has made enormous strides in this particular branch of aviation during the last few years, and British seaplanes and flying boats are unbeaten for their qualities on the sea as well as in the air. The demands for seaworthiness which British seaplanes of all types have to fulfil are vastly more exacting than those which apply in other countries, and the fact that our machines have to operate around exposed coast lines has resulted in the question of seaworthiness being specially studied. Size for size, British flying boats may safely be assumed to be more seaworthy than those of other nations.

Of the two photographs on the right, the upper shows one of the Short " Calcutta " flying boats used by Imperial Airways, Ltd., on the Mediterranean section of the England-India air route. The machines have given excellent service, and the solitary one which came to grief some time ago was lost in weather conditions which no flying boat yet dreamed of could possibly have survived for very long. Even so, the " Calcutta " remained afloat for several hours.

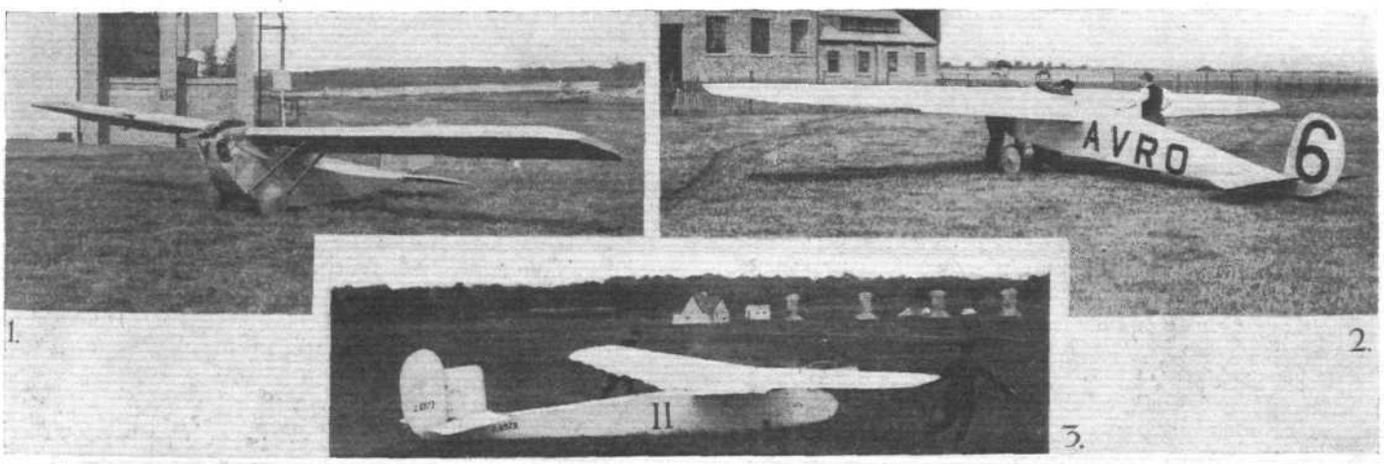
The lower photograph, on the right, shows the Supermarine-Rolls Royce S.6, on which Flying Officer Waghorn won the 1929 Schneider Contest at an average speed of 328·63 m.p.h., and on which later Squadron-Leader Orlebar established a world's speed record of 357·7 m.p.h.



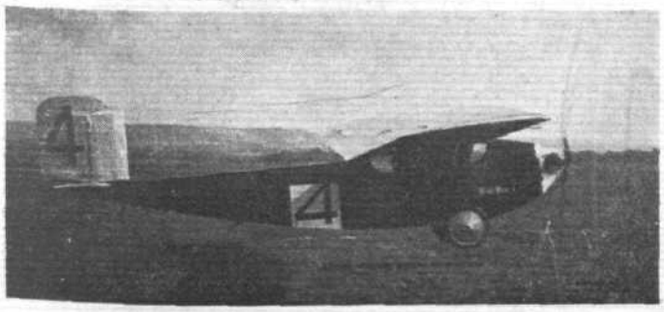




The Beardmore " Inflexible," shown on the left, was an interesting experiment in size. Its wing span was more than 150 ft. Like a good many other very large machines, the weight of the structure was somewhat great, and the useful load correspondingly reduced. Nevertheless, the machine has been flown in public on several occasions, attracting great attention.



1. 2. 3.

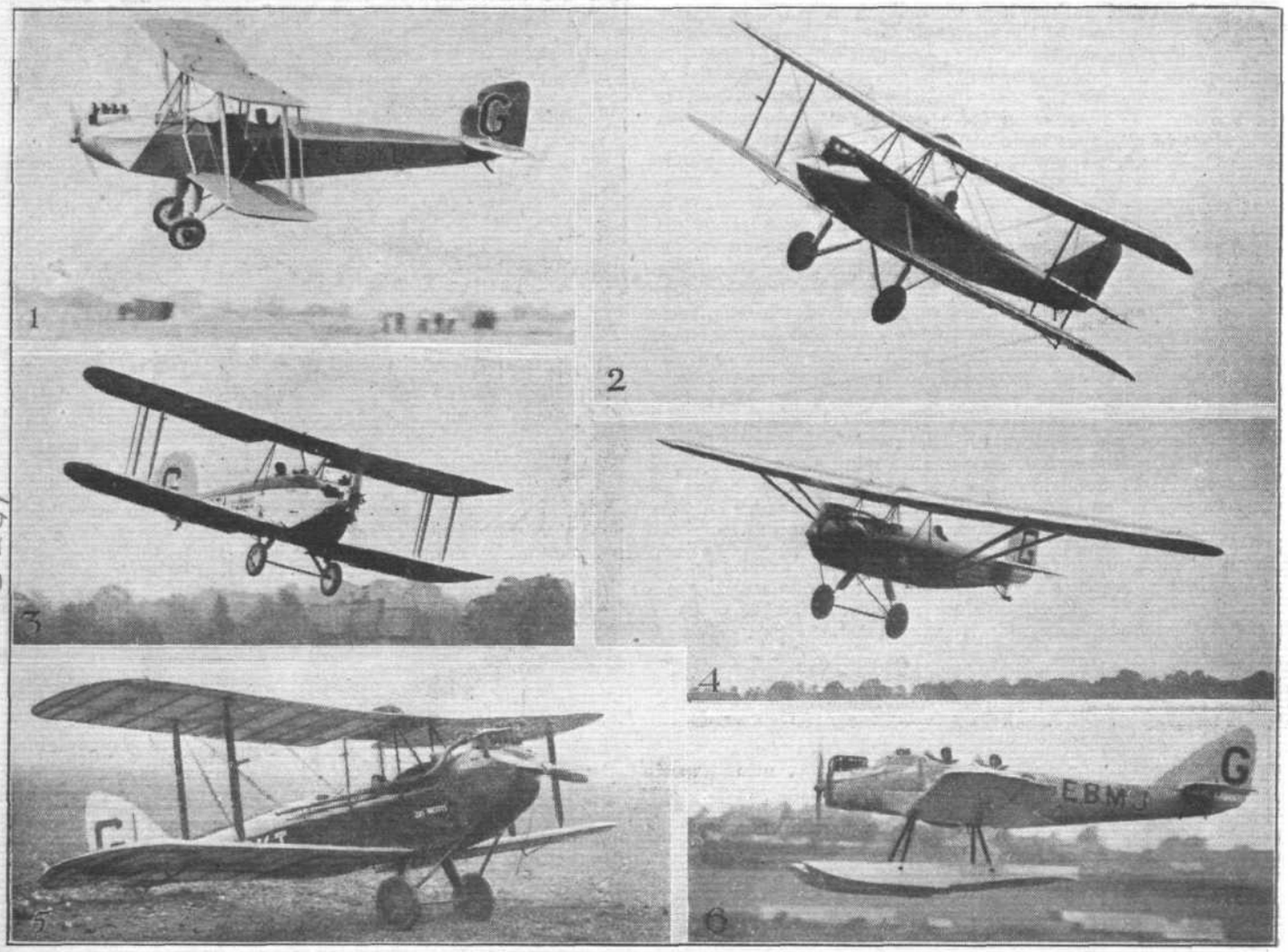


The light 'plane of to-day may be said to have been evolved from machines of much lower power. Above are shown three single-seaters from the Lympne competition : 1, the A.N.E.C. 2, The Avro Monoplane. 3, The " Wren." All had motor-cycle engines of quite low power, and the A.N.E.C. and " Wren " did more than 80 miles to a gallon of petrol.

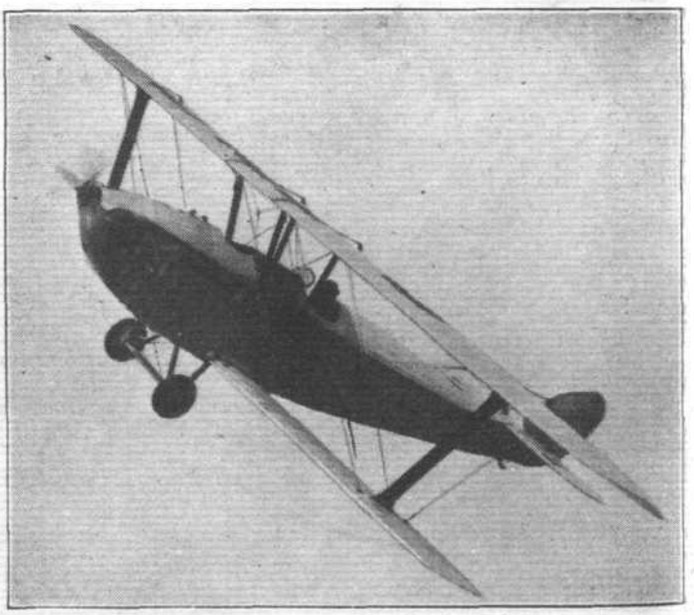
The machine on the left is the Beardmore " Wee Bee," which won the Lympne two-seater competition. It was fitted with a Bristol " Cherub " engine.

FLIGHT *Photos.*]

LIGHT 'PLANES



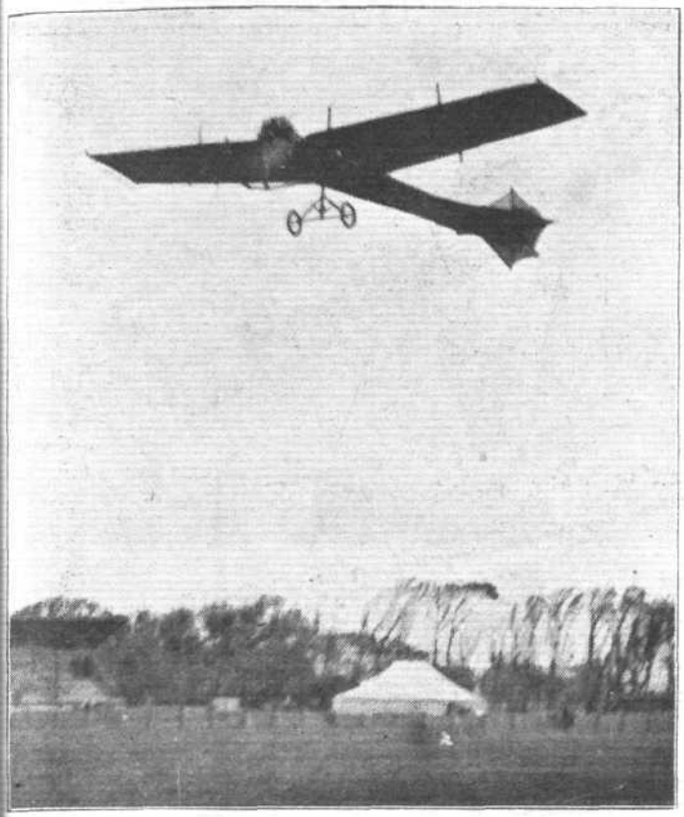
Six types of well-known modern light 'planes: 1, Simmonds "Spartan." 2, Avro "Avian." 3. Blackburn "Bluebird." 4, Westland "Widgeon." 5, The original D.H. "Moth." 6. Short "Mussel."



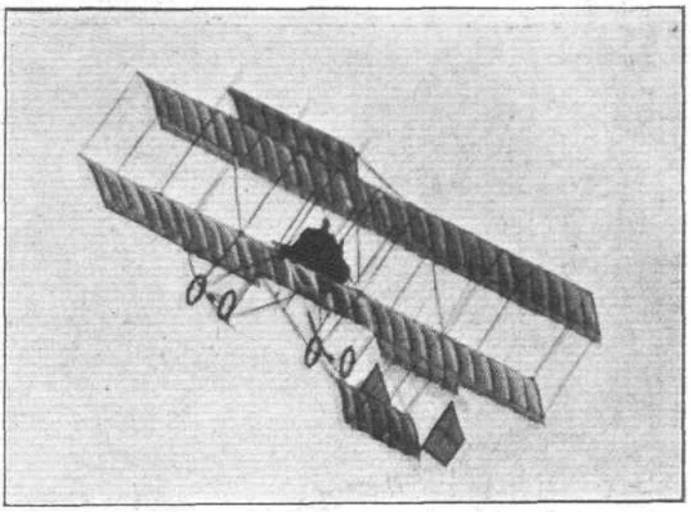
Before the beginning of the Light 'Plane Movement, a glider meeting was held at Itford Hill in Sussex. This was won by a Frenchman, M. Maneyrol, who is seen on the left during his flight of more than three hours. On the right, the Hawker "Cygnet" light 'plane ("Cherub") which won the *Daily Mail* Competition.

[FLIGHT *Photos.*

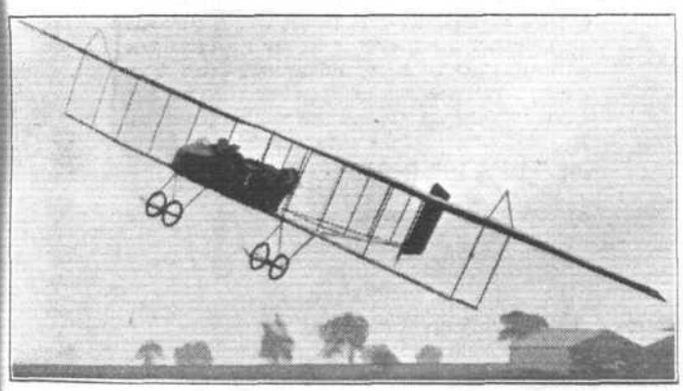
IN FULL FLIGHT



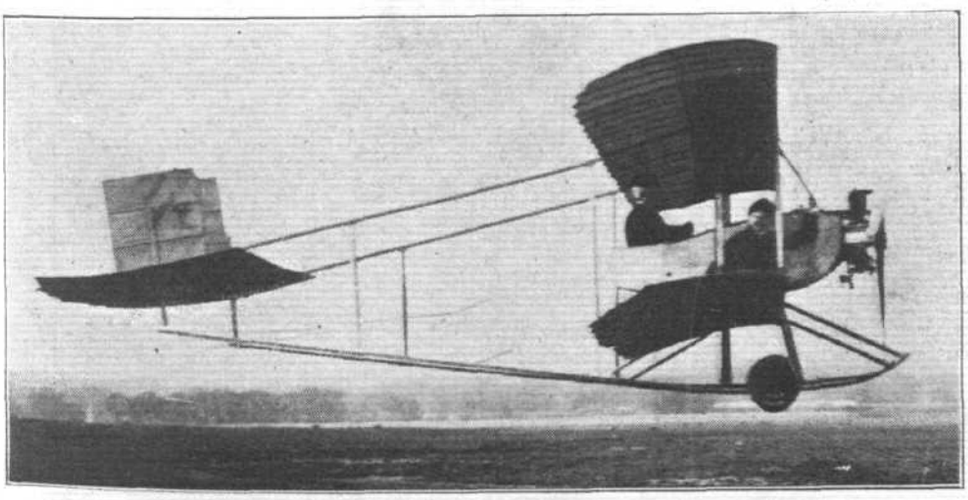
Here we see Hubert Latham flying the graceful Antoinette monoplane in a "gale" of 30 m.p.h. at the Blackpool meeting, 1909.



This is a "snap" of Claude Grahame-White executing a then remarkably steep bank on a Henry Farman during the Hendon "Demonstration" in May, 1911.



Another view of Claude Grahame-White banking on a Henry Farman—this time the "Wake-up, England!" 'bus of later date—1913.

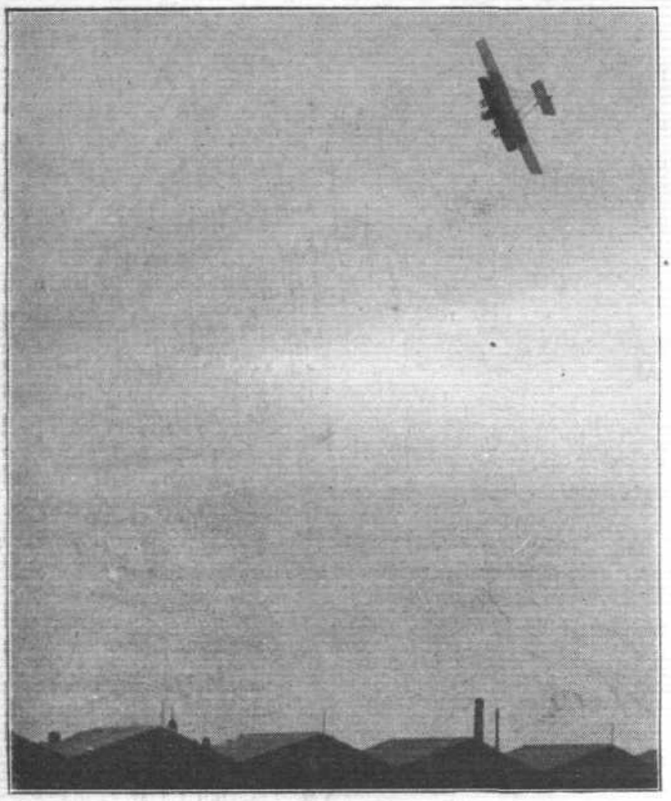


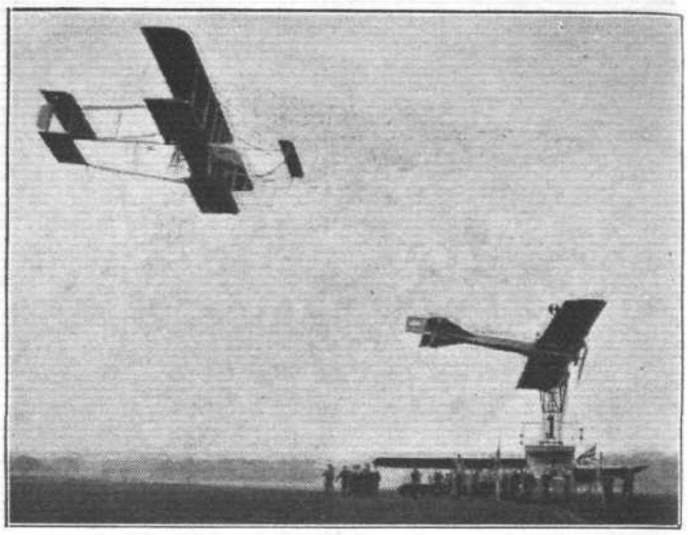
Two interesting "events" that happened at Hendon in 1912 are depicted here. Above is M. Moineau, the French pilot, flying the Breguet biplane—or "flying coffee-pot," so called because of its metal construction—when it made its first appearance at the London Aerodrome.

The other picture shows René Caudron introducing the 35 h.p. (Anzani) Caudron to Hendon—its future English home—early in 1912 with, if we remember rightly, "Jimmy" James seated on the wing.

FLIGHT *Photos.*]

MEETINGS



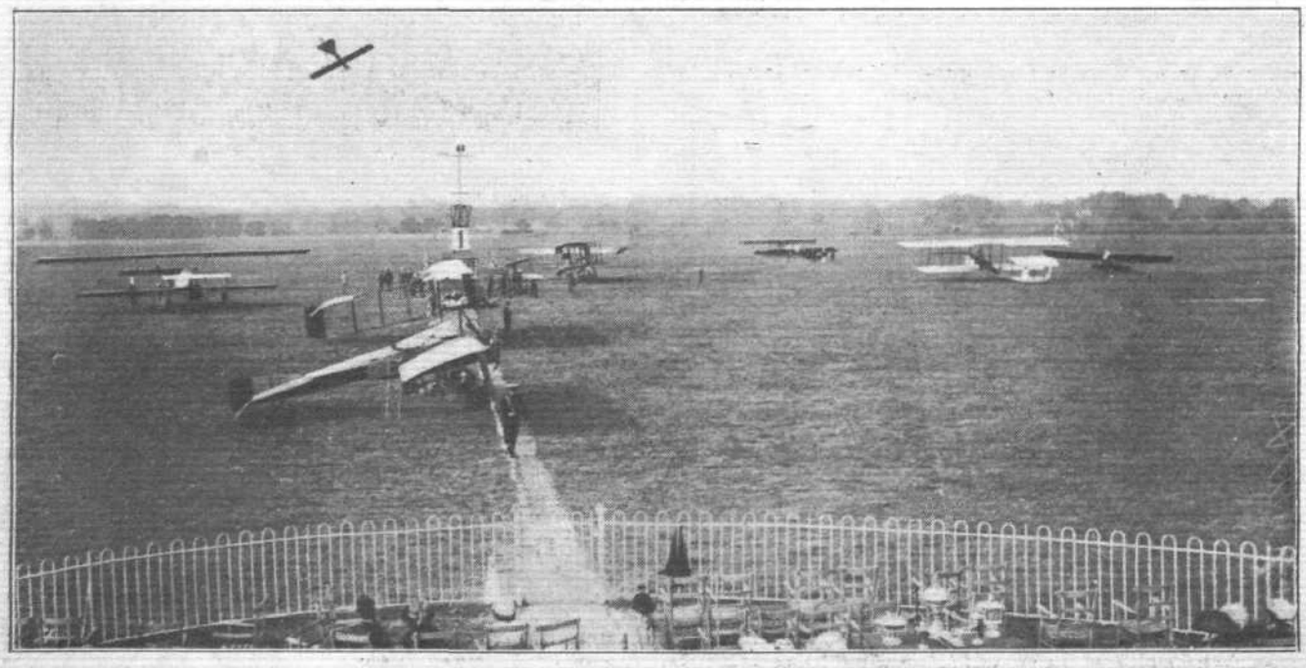


WE give here four incidents from the popular and remarkable series of flying meetings which were held at the London Aerodrome, Hendon, during 1913. The first top left shows M. Chevillard, the well-known French pilot, giving one of his extraordinary exhibitions of stunt flying on the Henry Farman.

Next to this, on the right, is a close finish to one of the handicap races round the pylons between P. Verrier on the Maurice Farman and Jules Nardini on the Deperdussin monoplane.

At one of the August meetings the spectators experienced a thrill by the sudden appearance of a tiny tractor biplane with a remarkable turn of speed—for those days. It was Harry Hawker on the Sopwith "Tabloid," who had flown over from Brooklands. Here you see him "hurrying" past the hangars.

Below is a scene just before the start of a race at the Sixth London Meeting held during August, 1913.



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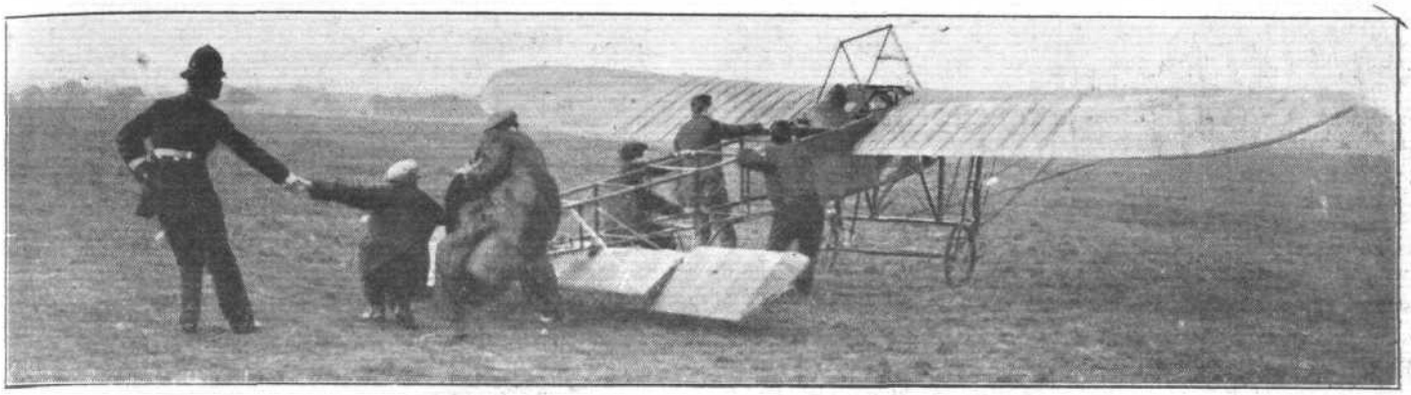
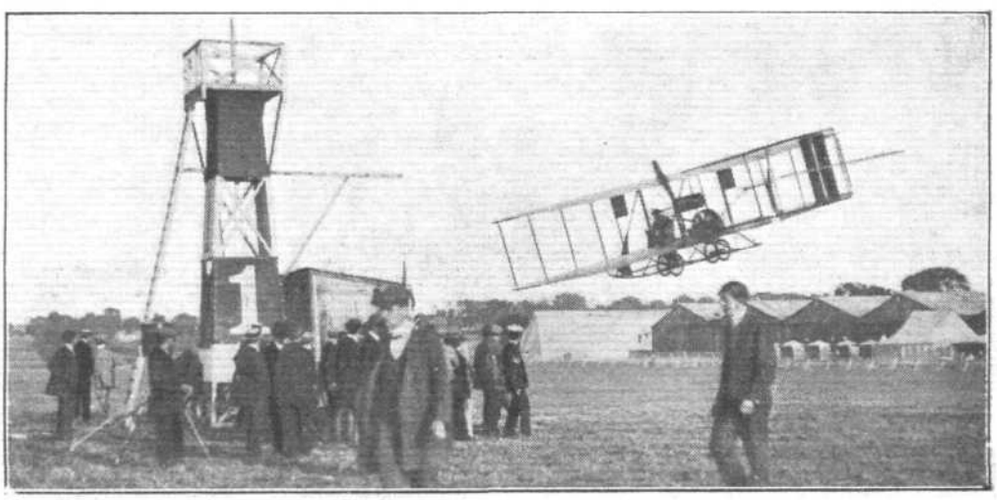


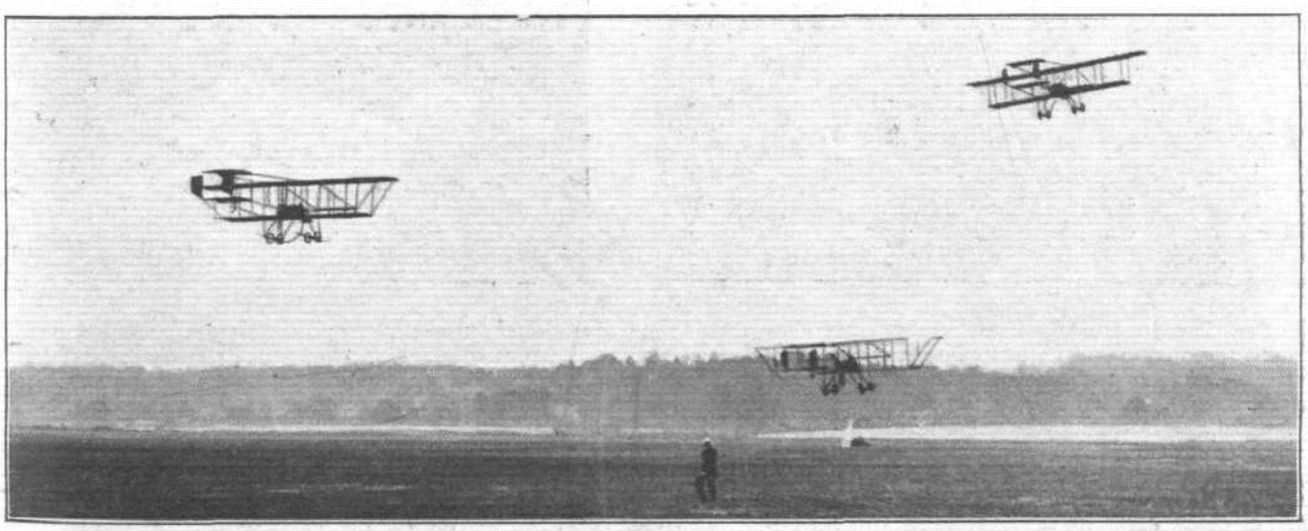
FOUR more incidents from British flying meetings, three from Hendon and one from Brooklands. At the top we see "Robert" lending a helping hand in holding back Marcel Desoutter's Bleriot monoplane before the latter sets out on one of his excellent exhibition flights.

Below, Walter L. Brock—chewing hard, no doubt—on his Bleriot, is being rapidly overhauled by M. Martz on the Morane Saulnier during the First International Contest, October, 1913.

Next we see George Beatty, of U.S.A., giving one of his low-flying exhibition of stunts on the Beatty-Wright biplane.

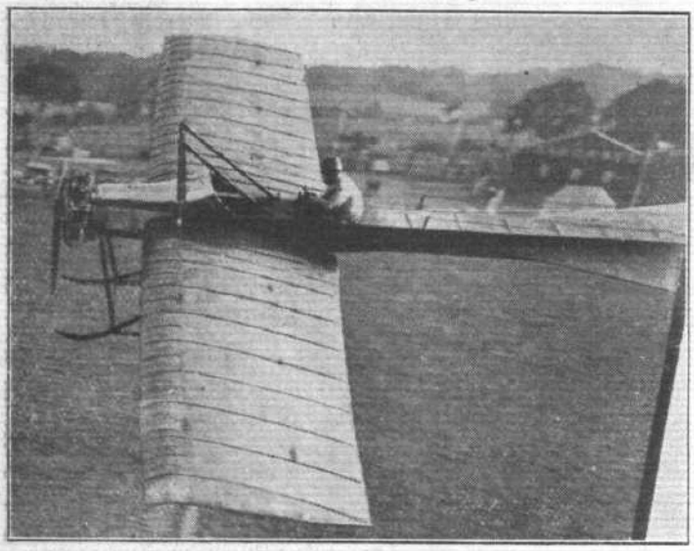
Finally, a cross-country race in progress at Brooklands during the summer of 1913.

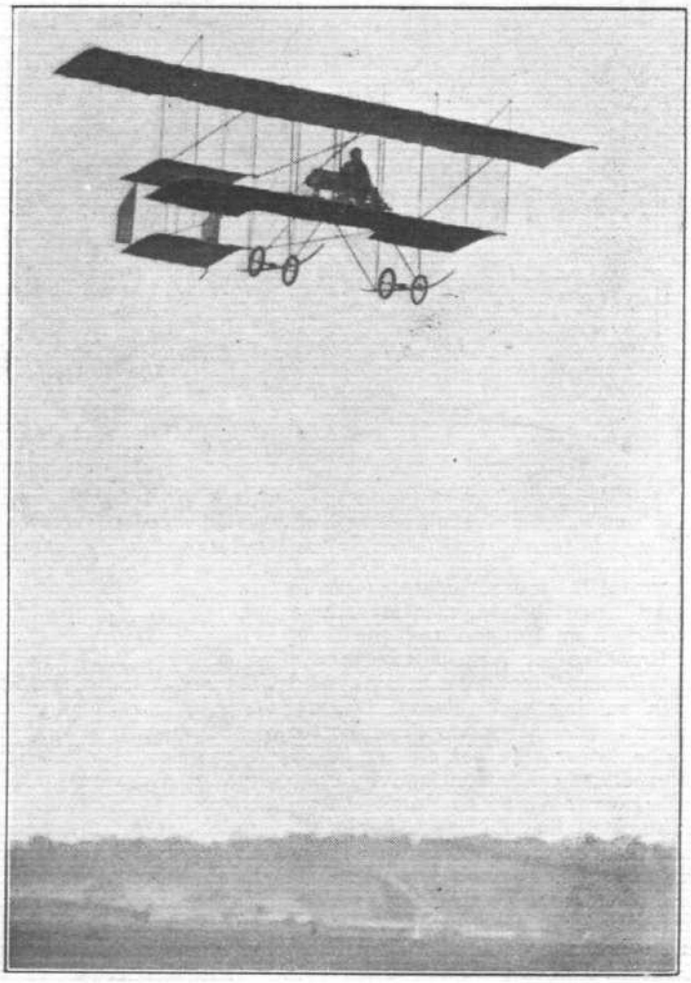


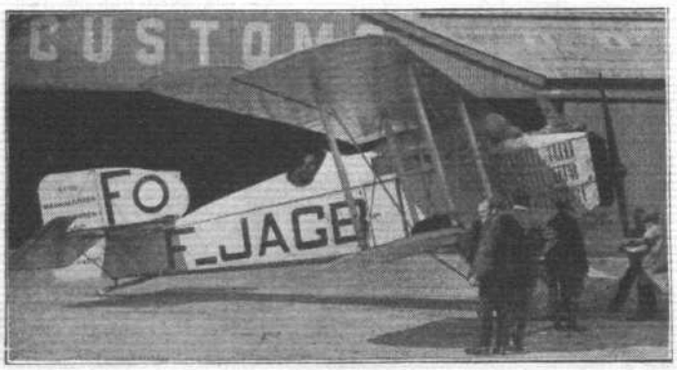


FLIGHT *Photos*]

ODDMENTS





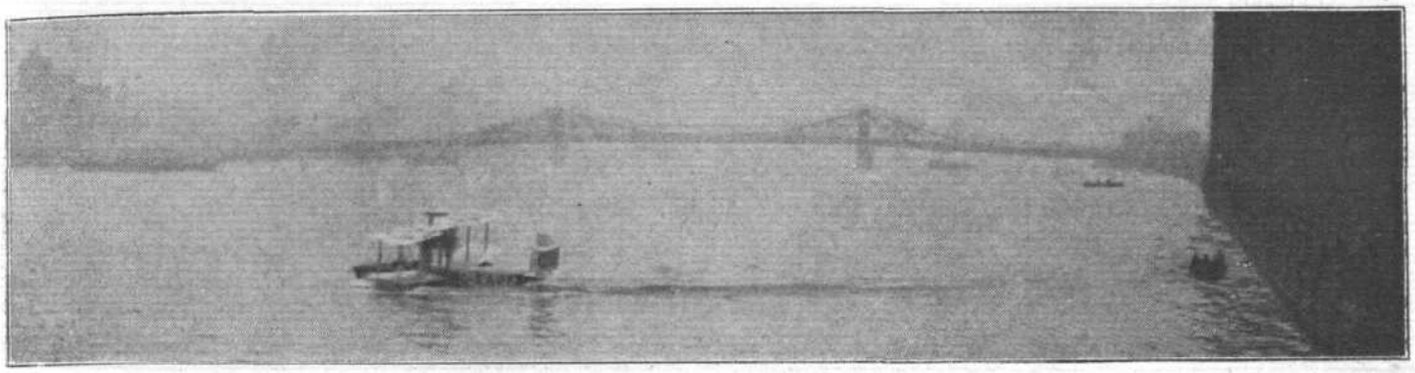


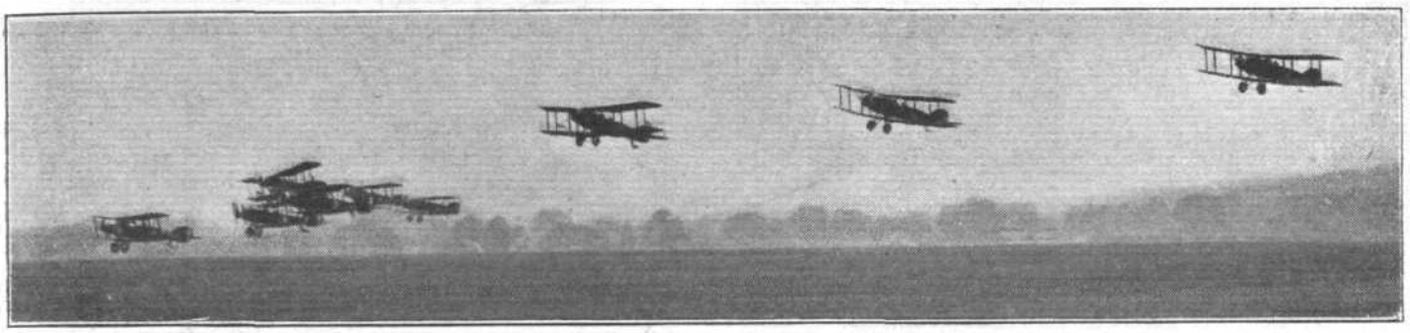
JUST a few items, taken at random, are shown on this and the next page. Our first shows N. Spratt flying the 60 h.p. "Dep" in a speed handicap at Hendon in 1913, and the photograph raised the question "are these wings bending?" Put a rule along the leading edge and see for yourselves. On the right is M. Pegoud setting out to give his first demonstration of looping in England at Brooklands, September, 1913.

In the centre, still in 1913, see, on the left, one of the "natives" of Brooklands, Gordon England to wit, flying the Hanriot monoplane "Henrietta," on the occasion of the race to Brighton in May of that year. On the right is the late Sir John Alcock—then plain "Jack"—winning the Easter Aeroplane Handicap at Brooklands on Ducrocq's Henry Farman.

The last two photos show the beginning of regular British passenger and air mail services; on the left, the Handley Page biplane about to start on the first London-Paris service from Cricklewood in 1919, and on the right, the Breguet mail 'plane about to leave Hounslow for Paris in 1920.

[FLIGHT *Photos.*





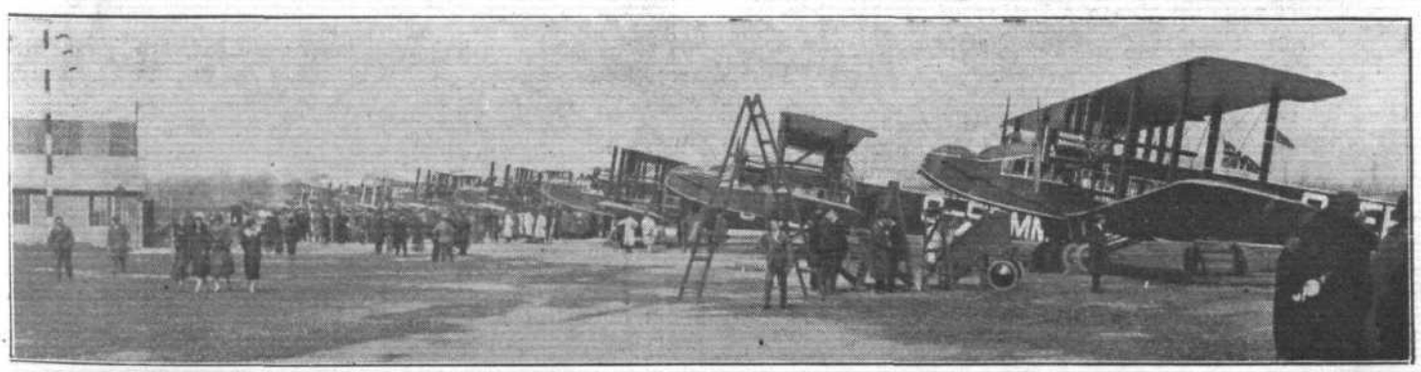
OUR second set of "oddments" begin with the "Thames as an airport," showing a photograph of the Vickers "Viking" amphibian flying boat immediately after it had alighted on the Thames at Westminster in February, 1921. The manœuvre was in the nature of an experiment, to ascertain if it were possible to operate an air service direct to and from the Thames.

Below this picture we have a photograph recalling the extraordinary series of Royal Air Force Displays which have been held annually at Hendon Aerodrome since 1920.

On the right we show two recent events of importance. The uppermost concerns the inauguration of the first Imperial Air Route, when, on December 27, 1926, Sir Samuel Hoare, Secretary of State for Air, accompanied by Lady Maud Hoare, Air Vice-Marshal Sir Geoffrey Salmond, Mr. C. L. Bullock, and others, set out for India in a DH. "Hercules" (three Bristol "Jupiters") piloted by Capt. F. L. Barnard. The journey was successfully accomplished, Karachi being reached on January 6, 1927. Our photo was taken just before the start.

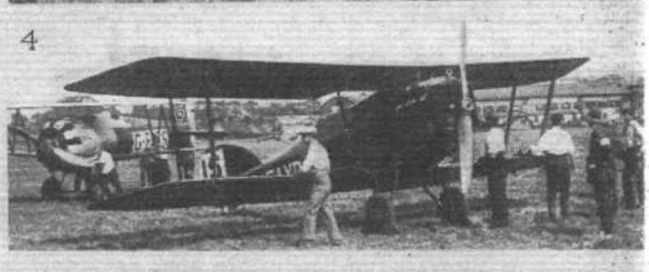
The second event depicts a glorious British failure. It shows the Hawker "Horsley" machine (Rolls Royce "Condor") piloted by Flt. Lieut. Carr, accompanied by Flt. Lieut. Mackworth, shortly after leaving Cranwell on the second attempt at a world's long-distance non-stop record flight towards India. Shortly after the photo was taken oil trouble developed, and a hurried but wonderfully successful landing was made at Martlesham.

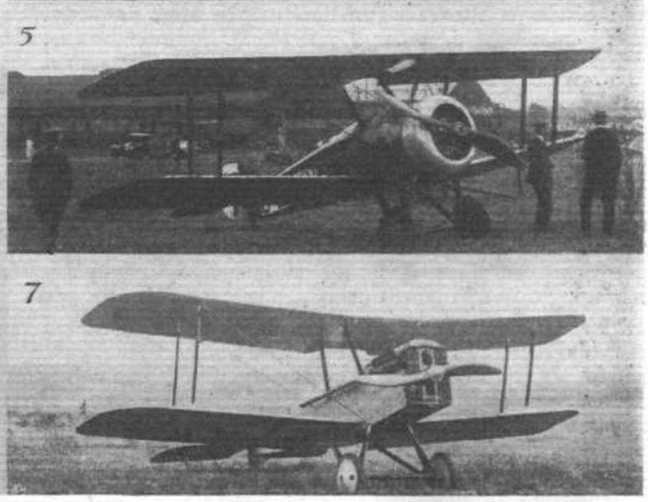
Below is a line up of the Imperial Airways fleet of airlines on the occasion of the visit of the Dominion Representatives to Croydon in October, 1926.



FLIGHT *Photos.*]

THE AERIAL DERBY

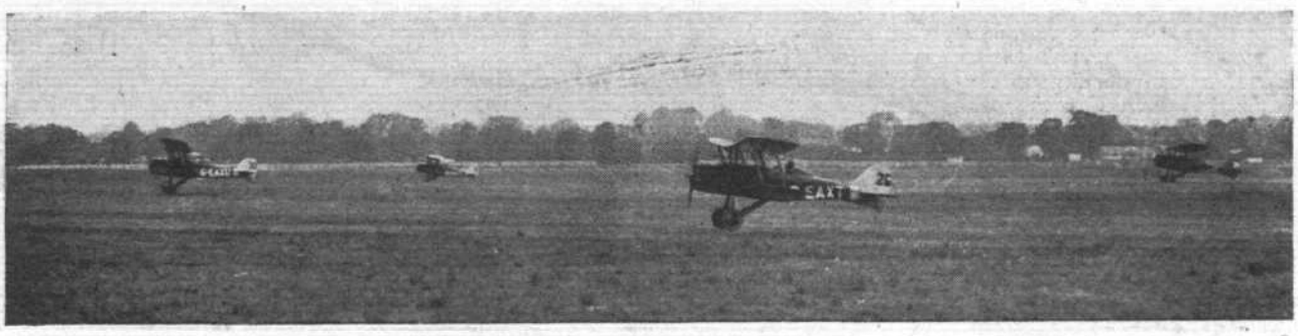




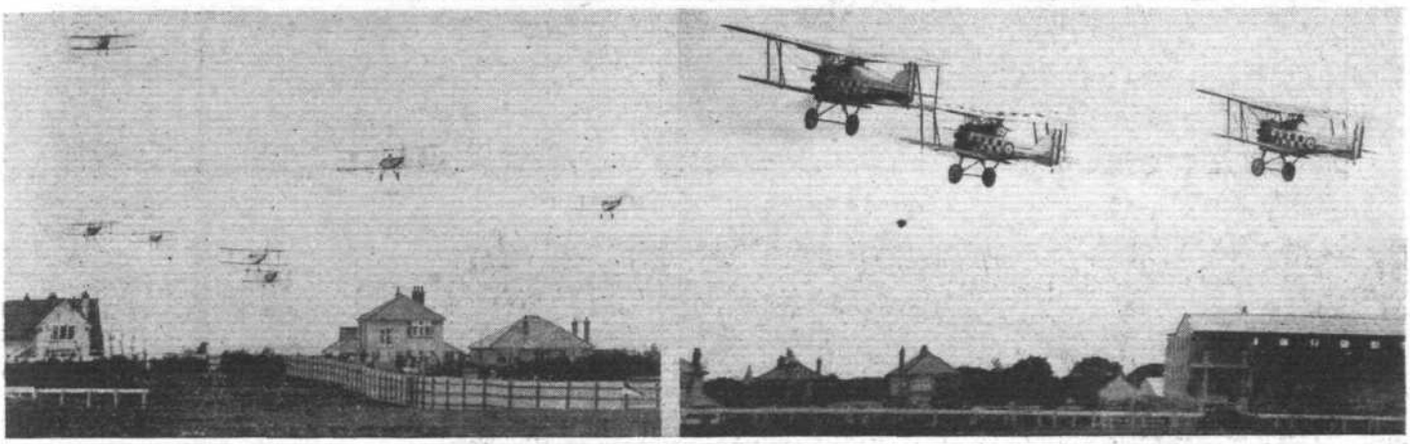
ON this page we give a selection of photographs concerning the classic and popular air race known as the Aerial Derby, inaugurated in 1912. At the top is the "line-up" of competing machines before the start of the fifth contest, which took place in July, 1920. The machine in the foreground is the Nieuport "Nieuhawk" piloted by "Jimmy" James, who finished second. Next are the two Martinsydes—the F.6 and the F.4.

Below this is a selection of typical Aerial Derby machines. They are as follows: (1) The Sopwith "Pup" (80 h.p. "Le Rhone"). (2) Nieuport "Nieuhawk" (300 h.p. A.B.C. "Dragonfly"). (3) Bristol "Bullet" (400 h.p. Bristol "Jupiter"). (4) Martinsyde F.4 (300 h.p. "Hispano"). (5) Sopwith "Camel" (130 h.p. "Clerget"). (6) Gloster "Mars I." (450 h.p. Napier "Lion"). (7) S.E.5a (220 h.p. Wolseley "Viper").

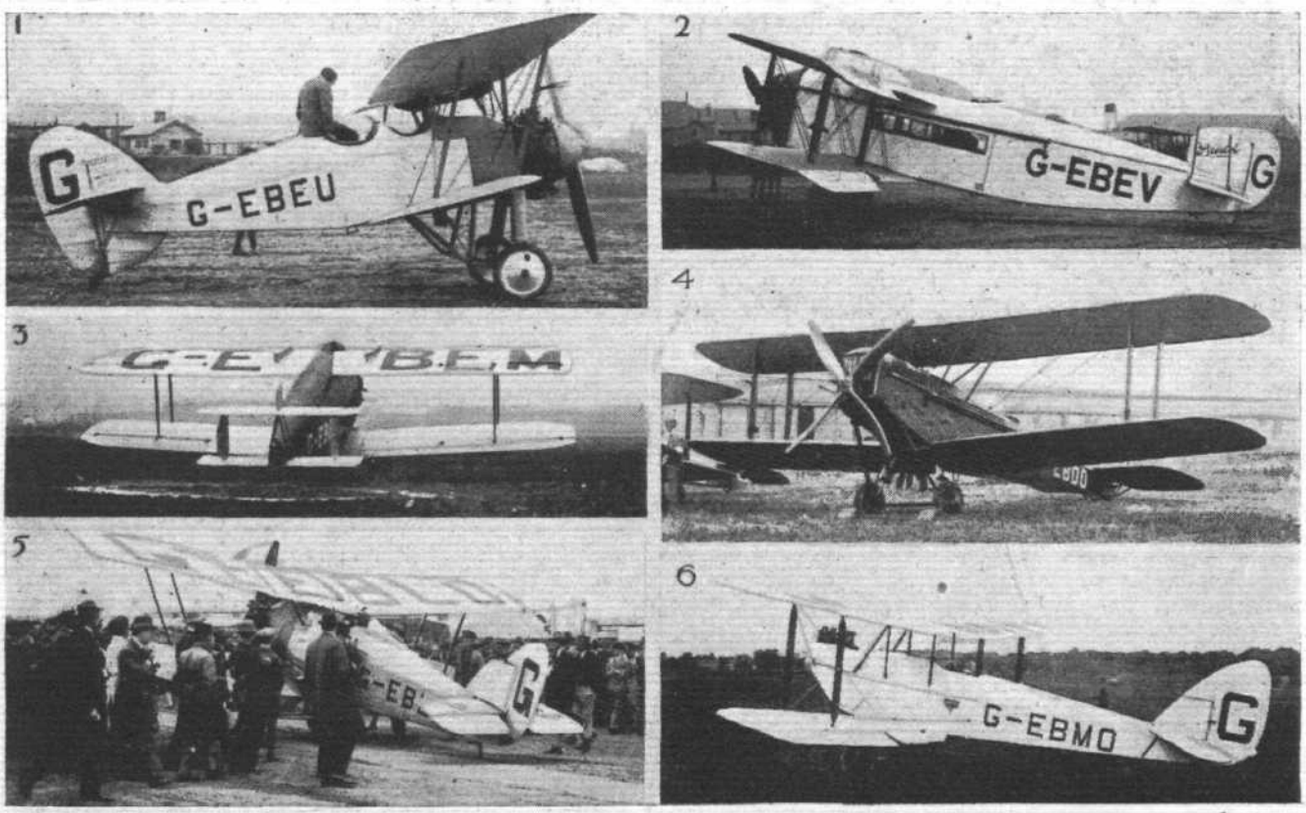
[FLIGHT *Photos.*



THIS shows the start for the first (and only) Oxford *v.* Cambridge Air Race, held at Hendon on July 16, 1921. It was a thrilling event for the competitors, from the two Universities, all flew S.E.5a's and started together.



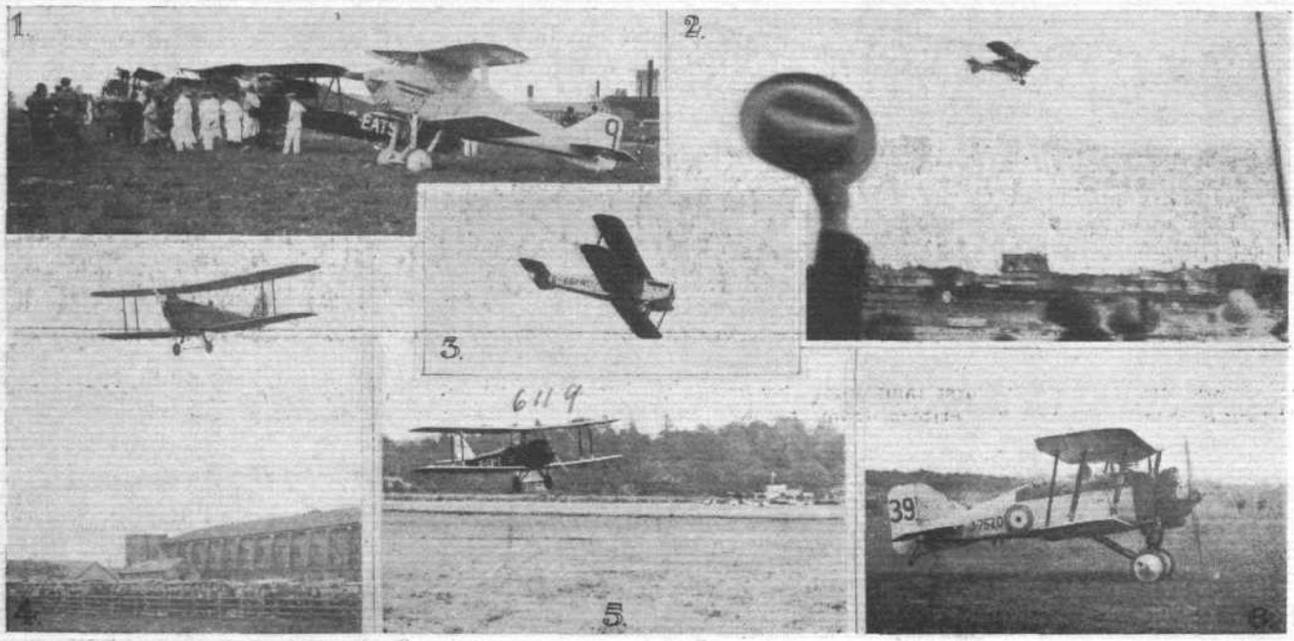
Many years after the first historical flying meeting at Bournemouth in 1910, this popular resort again held a meeting, two events from which are shown above. On the left, seven machines are seen flying in a race, and on the right three R.A.F. "Gamecocks" give a display.



The King's Cup Air Race, inaugurated in 1922, is the "biggest" of the British Air Racing events, which has now taken the place of the Aerial Derby—although the latter may be revived. It is a handicap race open to all types of aircraft (British) and not a pure speed race as with the Aerial Derby. Above we show a selection of King's Cup machines. (1) The Armstrong-Whitworth "Siskin" (Siddeley "Jaguar"); (2) Bristol 10-seater (400 Bristol "Jupiter"); (3) Vickers "Vulcan" (450 Napier "Lion"); (4) D.H. 37 (A.D.C. "Nimbus"); (5) Armstrong Whitworth "Siskin" (Siddeley "Jaguar"); (6) D.H. "Moth" (A.D.C. "Cirrus").

(FLIGHT *Photos.*)

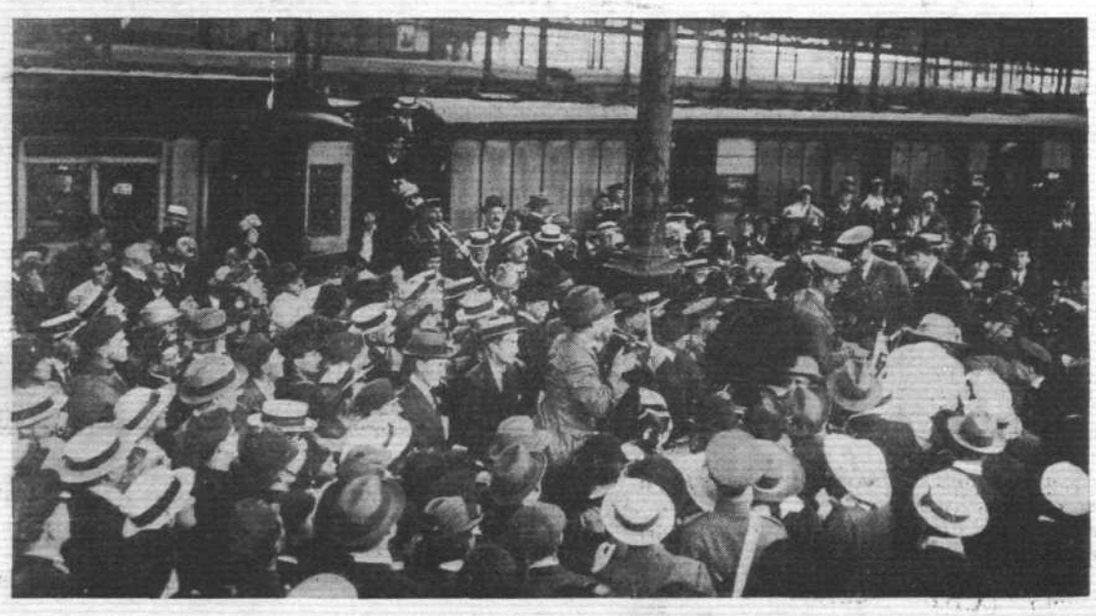
BRITISH RACES AND ATLANTIC FLIGHTS



THE photograph numbered 1 shows aeroplanes lined up for the start of the Aerial Derby in 1922. In front may be seen the Gloster Bamel. No. 2 gives Flight-Lieut. Jones in a Siskin doing the fastest time in the King's Cup Race of 1924. No. 3 shows the winner of that race, A. J. Cobham in a D.H.50. No. 4 is the finish of the King's Cup in 1927, won by L. Hope in a Moth. No. 5 shows the same pilot in another Moth winning the King's Cup in 1928 at Brooklands. In 1929 the sequence of Moth victories was, shall we say, interrupted by the victory of a two-seater Grebe, shown in No. 6, which was piloted by Flying Officer Atcherley, with Flight-Lieut. Stainforth as navigator. Each has since become famous as the breaker of a world's air speed record.

The middle photograph shows the crowd which welcomed the return of Hawker and Mackenzie Grieve, the first men who tried to fly the Atlantic. They were forced to come down in the ocean, and were rescued by a Danish ship.

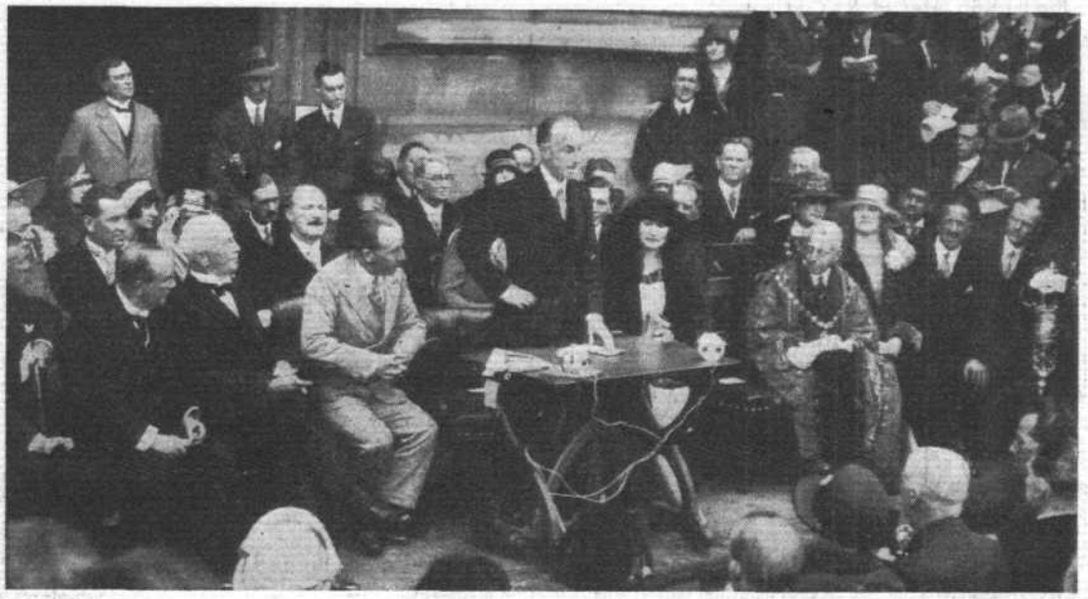
Down below we see the return to London of Sir John Alcock and Sir Arthur Whitten-Brown after making the first non-stop flight across the Atlantic from Newfoundland to Ireland.



FLIGHT *Photos.*

THREE GREAT FLIGHTS.

THE pictures on this page commemorate three great flights, and one very interesting club meeting. The top picture shows the gathering on the famous terrace of the House of Commons, when Mr. (now Sir) Alan J. Cobham returned from his flight to Australia and back. This was the third great journey which he made in the D.H. 50 aeroplane G-EBFO. On the first occasion, he took Sir Sefton Brancker to India and Burma, and back. The object of this journey was to enable the Director of Civil Aviation to co-operate with the airship experts who had gone to India to select



possible sites for airship stations. On this occasion, "FO" was a landplane, and had a Puma engine. The second flight was to Capetown and back, and then "FO" was given a Jaguar engine. Finally, this machine became a seaplane for the flight to Australia and back. On its return, special arrangements were made for it to alight on the Thames, at Westminster. The pilot and his two companions landed on the terrace, and were received by the Air Minister, Sir Samuel Hoare, the Mayor of Westminster, and a great concourse of notable people. In the top picture, Sir Samuel Hoare is speaking, with Sir Alan and Lady Cobham seated on either side of him.

Below, on the right, Sir Alan Cobham is shown flying the Singapore, in which he made a tour round Africa in 1927, accompanied by Lady Cobham. He flew down the Great Lakes, and then round the coast, returning by West Africa, where a flying boat was a most unique sight. No man has done more than Sir Alan Cobham to induce air-mindedness in the people of the British Empire.

The monoplane on the left-hand side of the page is the famous "Spirit of St. Louis," a Ryan, with Wright Whirlwind engine, in which Col. Charles Lindbergh made his famous flight across the Atlantic to Paris, in the summer of 1927. It was the second non-stop flight across the Atlantic, and the first solo crossing. The first of all the non-stop Atlantic flights was made in 1919 by the late Sir John Alcock and Sir Arthur Whitten-Brown, in a Vickers' Vimy, with two Eagle engines. Before Lindbergh started on this flight, his

nickname in America was "The Flying Fool," but since his success he has become the great national hero of the American people. In the same year, three other American aeroplanes crossed the Atlantic.

The bottom photograph shows the first meeting of the Household Brigade Flying Club.

FLIGHT *Photos.*

THE SCHNEIDER TROPHY CONTEST

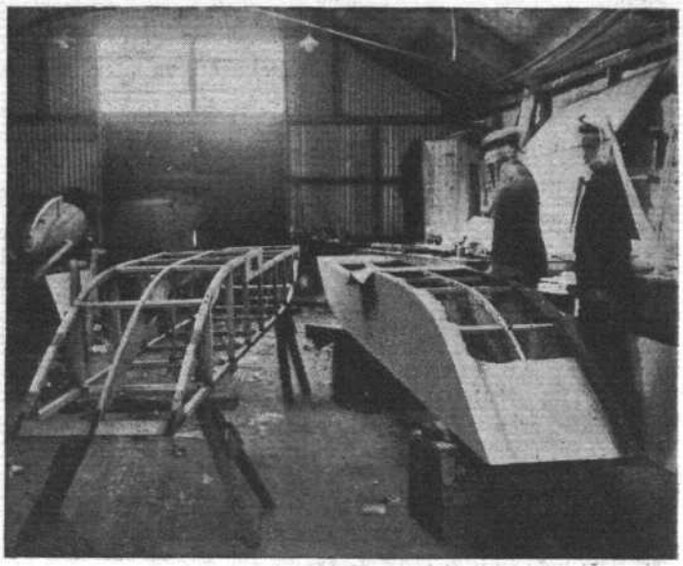
THE photographs on this page are mementoes of various Schneider contests. No. 1 shows M. Prévost, who won the first race for France. The meeting was held at Monaco in 1913, and the countries which entered were France and America. Prévost, in his Deperdussin monoplane with 100 h.p. Gnome engine, was the only competitor to finish the course. His official speed over the 150 sea miles was 45·75 m.p.h. Pictures Nos. 2 and 3 belong to the contest of 1919 at Bournemouth, which, owing to the sea mist and a series of mishaps, ended in a fiasco and had to be declared null. The flying boat in No. 2 was flown for Great Britain by Capt. Biard. The rules of that contest called for so many landings during the race, and this Supermarine struck some flotsam on the water and had to retire. The Italian Savoia boat (No. 3), piloted by Signor Janello, alone completed the course, but in the mist it was not observed at one of the turning points, and could not therefore be declared winner. The pictures Nos. 4, 5, and 6 were taken at Cowes in 1923, but we prefer to think of the Supermarine Sea Lion (shown in No. 5) as the winner of the 1922 contest at Venice. On each occasion it was piloted by Capt. Biard. Nos. 4 and 6 show the American navy's Curtiss racer, which, piloted by Lieut. Rittenhouse, carried off the cup in 1923 at Cowes. This was not only the first American win, but it was also the first entry by a Government department for the Schneider contest. Since that time the contest has been waged entirely between the Governments of the competing countries. In 1925 the American army successfully defended the trophy, and the winner, Lieut. J. Doolittle, is shown on the floats of his winning Curtiss in picture No. 7. This was the first year in which the speed surpassed 200 miles an hour, for Doolittle won easily at 232·57 m.p.h. This, however, was America's last win to date. Next year the Italian air force entered, and in the Macchi 39 the low-wing monoplane made its first appearance in Schneider contests. Photograph No. 8 shows the Macchi in which Maj. Mario de Bernardi won, at a speed of 246·496 m.p.h., at Hampton Roads in 1926. Since then the Schneider has been twice won by low-wing monoplanes, both belonging to the Royal Air Force, at Venice in 1927 and on the Solent in 1929.

(FLIGHT *Photos.*)

TWENTY-ONE YEARS' PROGRESS OF SEAPLANE DESIGN

By H. OSWALD SHORT

Famous brothers have not been uncommon in the history of aviation. In the United States the Wright Brothers pioneered aviation by their long and painstaking work in the wind tunnel, with gliders, and finally with power-driven machines. In France the Farman Brothers, Henry and Maurice, were among the first to fly, and are still among the most famous of French aircraft firms. In this country we have had Short Brothers, Horace, Eustace and Oswald, who were among the very pioneers of British aviation, and who have made the seaplane—using the term to include both the twin-float type and the flying-boat type—their particular sphere. Horace Short was not spared to see the almost startling development which the seaplane has undergone in the last five or six years, but Eustace and Oswald are carrying on the good work which the brothers started at Eastchurch in the earliest days, and we have been fortunate enough to persuade Mr. Oswald Short to give for the benefit of FLIGHT *readers his impressions of the progress made in seaplane design in the 21 years that have elapsed since the first number of* FLIGHT *appeared.*



Float-building in the Early Days: A view inside Short Brothers' Float Shop at Eastchurch. Note the wire-braced construction.

ALL readers of FLIGHT will wish to congratulate the Editor and the staff of this journal on its having attained its twenty-first birthday.

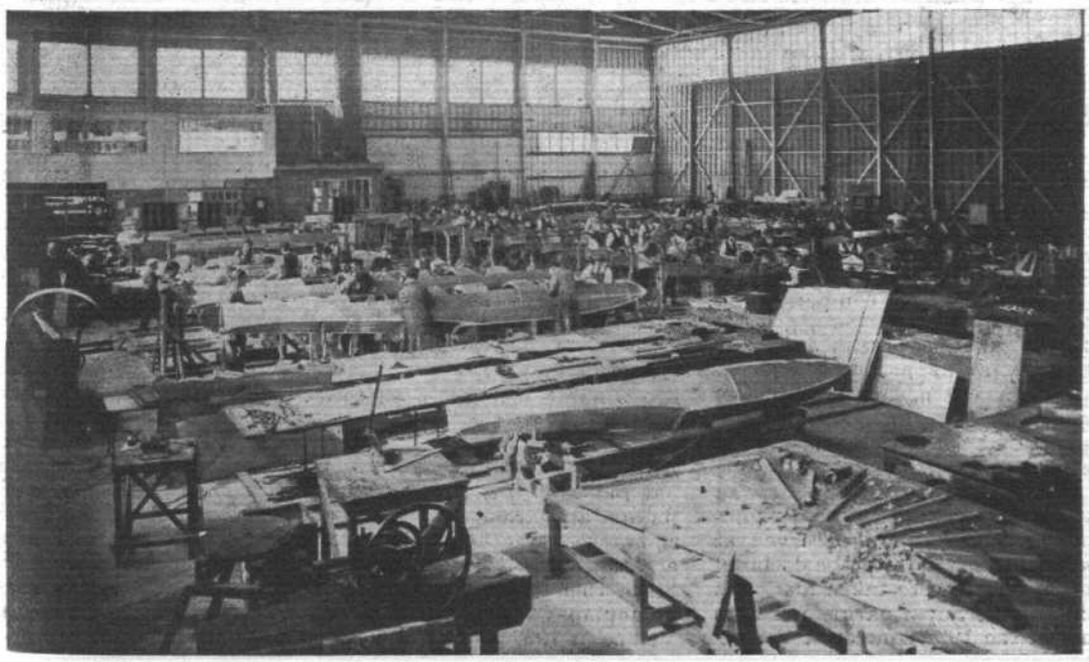
The pioneer airmen and aircraft builders will join most heartily in these congratulations in remembering that FLIGHT is one of those pioneer aviation journals which has existed from the very beginning of practical "heavier-than-air" flying machines in this country, and which in those early days gave voice to the aspirations of a small but enthusiastic group of experimenters seeking to convince a reluctant public that their ideas were not so "crazy" as they were generally supposed to be.

Although 21 years is a mere "flash in the pan" as ages roll on, yet it is a sufficiently long period that we have with us to-day many expert airmen and aircraftsmen who cannot remember a time when aeroplanes did not exist, just as there are many more alive to-day who cannot remember the astonishment which a motor car in the streets of London created.

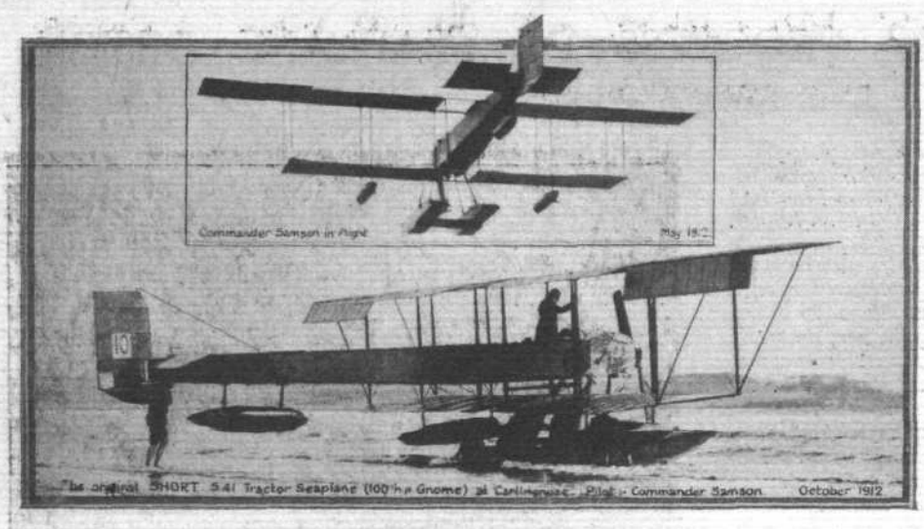
The Technical Editor of FLIGHT has honoured me with a request to express in this special number of FLIGHT some views on the progress of seaplane design during the period under review. It is not an easy matter to accomplish because of the difficulty of drawing a pen picture sufficiently clear as to make those who are only conversant with the design and construction of modern seaplanes, realise the crudities of early seaplanes in the light of present-day knowledge.

A series of comparative photographs of early and present-day seaplanes would be much more effective in illustrating the progress that has been made, and in such photographs the progress in methods of detailed construction and cleanliness of design would be more apparent than the subtle scientific development that has taken place in the aerodynamic and hydrodynamic properties of the machines and floats.

The first seaplanes were produced in the latter part of 1911 and during 1912 by the process of replacing the wheels and skids of aeroplanes by flotation gear. This development from the aeroplane to the seaplane was approached with great caution by the experimenters of the day. The effect of alighting on the water at high speed was an unknown quantity. It was assumed that in any case the resistance of the water to the floats would be very great, and it appeared highly probable that the high centre of gravity of the machine in relation to the point of contact between the floats and the water would create a couple causing the machine to turn over in spite of the forces which might be brought to bear with tail plane and elevator to counteract this tendency. So fearful did this bogey become when the subject was discussed that a design was prepared of a device in which a tube suspended from the seaplane, and pointing forward, was intended to inject



In Modern Times: A corner of the present-day float shop of Short Brothers at Rochester. The floats are of all-duralumin construction, and the shape is very different from that of the old flat-bottomed floats.



The original Short seaplane, flown by Commander Samson in 1912. It was fitted with a 100-h.p. Gnome.

water into a compartment in the tail end of the fuselage, thus adding a weight aft to resist by its inertia the somersaulting couple referred to. The idea was not carried into practice, and it is a remarkable fact that possibly the first machine to land on water in this country did so by means of rubber bags inflated with air, which were attached to the existing wheels and skids of an aeroplane in such a manner that the wheels entered the water first, thus creating a great resistance and retarding effect upon the machine when it touched water. That this machine did not somersault on contact with the water was very encouraging to those who had under construction seaplanes in the proper sense of the word.

It is a remarkable fact also that three distinct types of seaplanes produced in 1912 possessed characteristics which still survive, and are still undergoing interesting development to-day.

Gnosspelius produced his single float seaplane at Lake Windermere, whilst Swann and later Howard Wright, produced seaplanes in which the main floats alone provided complete fore and aft stability on the water. This system of flotation in seaplanes is in general use to-day, but it has only been made really practical by the scientific research work of recent years into the under-water shape of floats, which is of vital importance in this type of flotation gear.

Short Brothers produced a twin-float tractor seaplane with wing-tip floats, and in addition a tail float which gave a three-point suspension to the machine on the water. The main floats were flat-bottomed without a step, but they were placed in such a position that the rear edge of the floats acted as a step in breaking the continuity of the water flow at a suitable distance behind the centre of gravity of the seaplane.

The shape of these floats was crude in the extreme from the point of view of air resistance, but the flat under-surface of the floats was highly efficient in its planing properties, and made for success in permitting the machine to take off the water with the low horse-power then available in comparison with the all-up weight of the machine. This type of machine became almost universally used and lasted without radical change in appearance until as late as 1920.

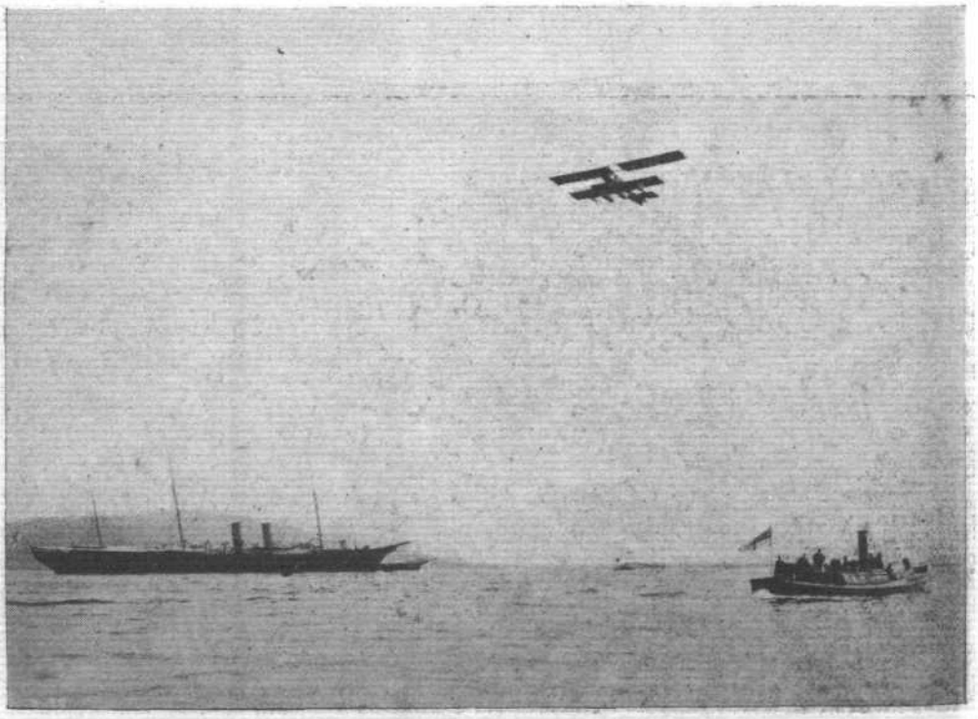
A sense of the progress made since the advent of the seaplane to the present day may be found by comparing a modern specification for a military type seaplane with an Admiralty order for seaplanes in 1912. In that year nothing further was asked for than that the machine should fly with two pairs of eyes and possibly a compass.

Seaplane builders were fully "approved firms" in the real sense of the term, and were subject to no restrictions of any kind. It was wisely realised that it was necessary to learn to walk before trying to run, and the requirements, meagre as they were, were quite difficult enough to carry out. A top speed of 60 miles per hour was considered rather wonderful and a ceiling of 5,000 ft. exceedingly good. To-day, the list of military equipment for a seaplane covers many sheets of foolscap, the disposable load may amount to at least one ton, a ceiling of 30,000 ft. is demanded and met, and in addition a top speed of at least 160 or 180 m.p.h. is expected. Aircraft designers, engine designers and aircraft pilots alike may equally share the credit for this progress, remembering that it would not have been made without the aid of the latter in carrying out numerous flights on all the various types of seaplanes which have led up to the present stage of development. Another measure of the progress made is the comparison between the 60 m.p.h. top speed of a seaplane in 1912, and the 360 m.p.h. attained this year in the Supermarine-Rolls Royce Schneider Trophy seaplane.

To have pulled our first seaplane through the air at 360 m.p.h. would have required 21,000 h.p. That the speed has been achieved with one tenth of that amount of power indicates the great progress made in the aerodynamic efficiency of present day seaplanes.

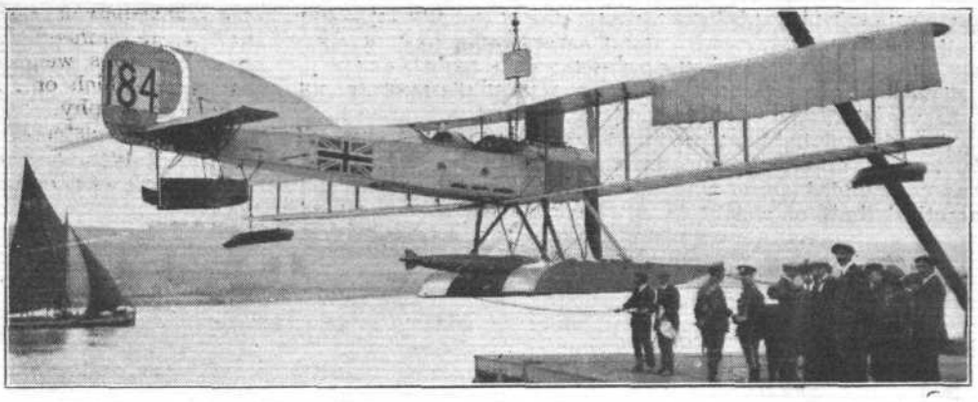
The advent of the flying-boat as distinct from the seaplane began in this country with the production of the Sopwith "Bat" boat in 1913, and was followed up in 1915 by the introduction of the Curtiss type flying-boat by the late Commander Porte. Commander Porte and his assistants at Felixstowe, working on the Curtiss boat as a basis of design, first developed the twin-engined flying-boat with wing tip floats, the general outlines of which have survived to the present day.

This new development in aircraft intended to operate from water at once gathered around it many strong supporters among nautical men and naval architects. This new school of thought held that the only sensible way of tackling the problem of aircraft intended for use at sea was to make boats fly, and they did not hesitate to express their contempt for the seaplane which was described by one member of the school as "the unnatural subterfuge of aeroplane constructors endeavouring to make aeroplanes float, when the obvious



In Full Flight: The original Short seaplane, Type S.41.

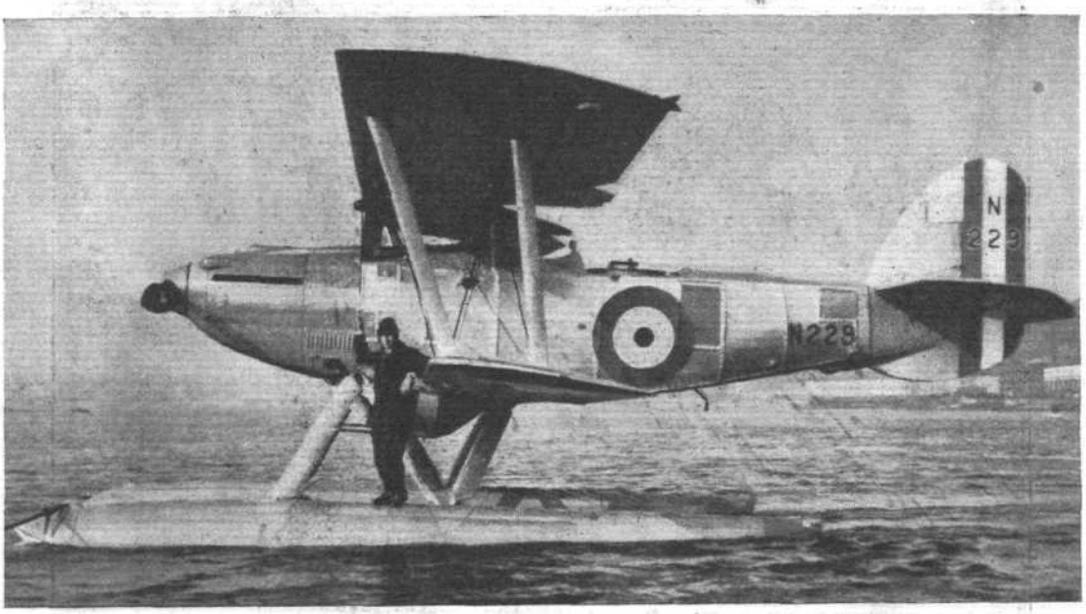
solution is to make a real boat fly." In fact, much criticism was directed against the seaplane, but time has shown that both types have their own sphere of usefulness, and neither has succeeded in ousting the other from its position. So far, the flying-boat has failed to survive in the sphere of operations carried out by seaplanes, but the seaplane may yet intrude into the sphere of operations at present carried out by flying-boats, because it has by no means reached a practical limit in dimensions and all-up weight. If what is known as the twin-hulled flying-boat is developed in the search of bigger and more seaworthy machines, as many believe it will be, it would really come under the category of the seaplane, since it will maintain lateral stability on the water by means of two separate floating structures.



An Early Torpedo 'Plane: The famous Short "225" being launched at Rochester in 1916. (FLIGHT *Photo.*)

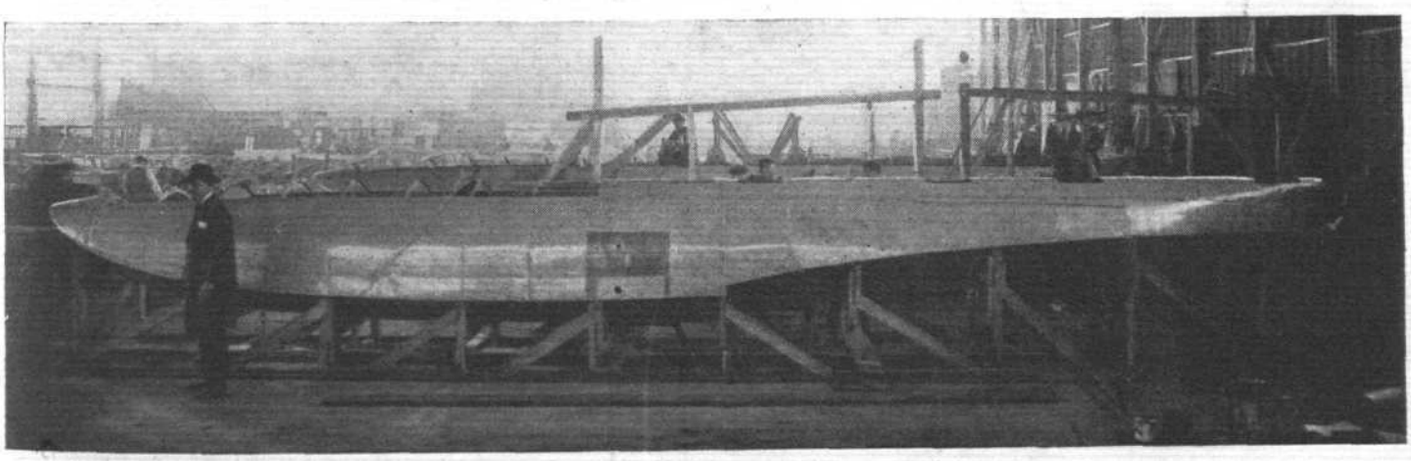
The increase in the performance of seaplanes and flying-boats during the period under review has been accompanied by a revolution in methods of construction and the materials used for construction. The flimsy structures of wood, wire, string and glue have given way to solid metal construction throughout, in a manner that now satisfies the most exacting engineer.

Photographs accompanying this article show a pair of floats under construction for the first "Short" seaplane, and for comparison a float now under construction at Rochester for a large monoplane seaplane. The former consisted of a wooden box girder braced with piano wire and covered on the sides and top with light-weight rubber fabric with three-ply wood on the under planing surface. The latter built entirely of duralumin and stainless steel forms a striking contrast in beauty of line and robustness of construction.



The latest Short Seaplane: The "Gurnard" is fitted with a Rolls-Royce engine, and provides an interesting comparison with the first Short Seaplane.

The development of the British flying-boats has made

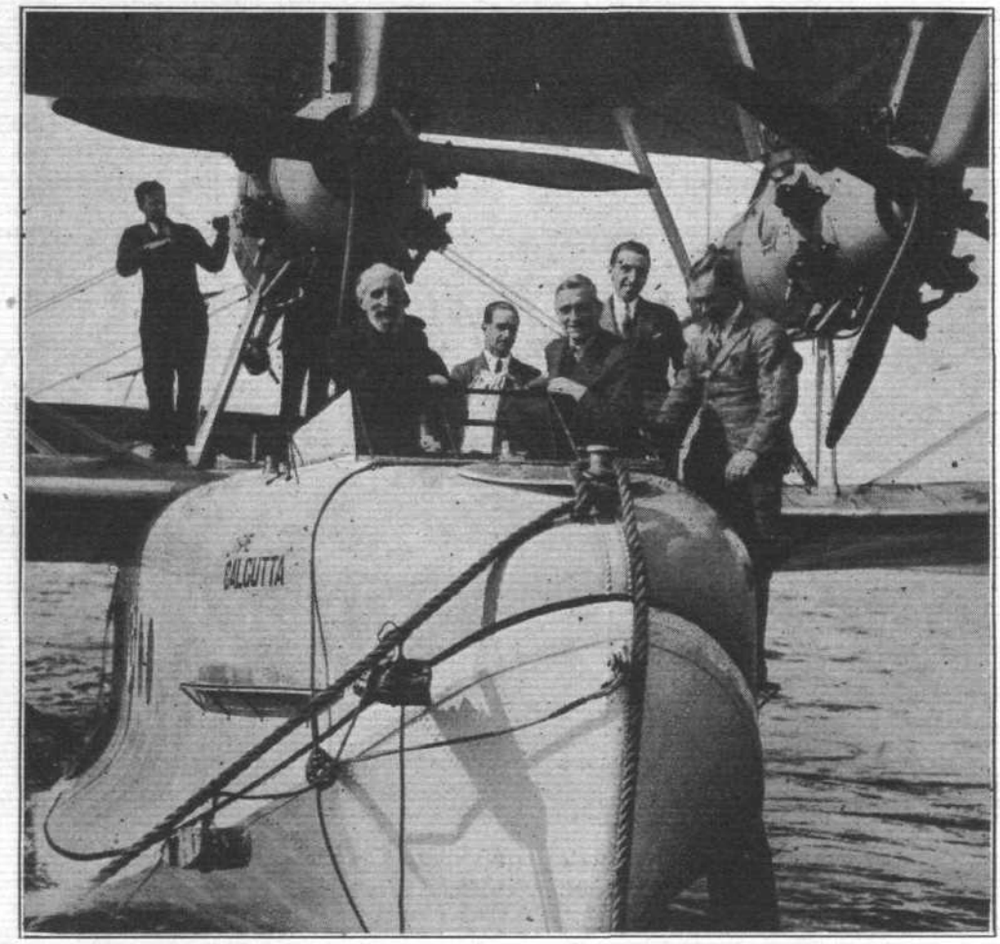


Twin-float principle applied to a large machine. This photograph shows one of the floats for the Short monoplane which is now nearing completion, and which will be fitted with three "Jupiter" engines.

astounding strides since the introduction of the first all-metal hull some five years ago. Metal construction has, in fact, set back to a far more distant point that barrier which is believed to exist to limit the practical dimensions of the " heavier-than-air " flying machines.

The giant flying-boat produced by Herr Dornier, with its 50 tons all-up weight, and its three tiers of roomy cabins, has confounded those who advanced the opinion that the practical limit of weight in a " heavier-than-air " machine was somewhere in the region of 6 tons. Today, it is clear that in the immediate future we shall possess flying-boats of 30 to 50 tons weight with a range of 2,000 miles, and a top speed which only a few years ago would have won the Schneider Trophy.

Let us not listen to those who foresee in every direction barriers to progress. We might well adopt as our motto the maxim " Go as far as you can see, and then see how far you can go."



A few months ago the French Ambassador, M. de Fleuriau, visited Shorts' works at Rochester to inspect the " Calcutta " ordered by the French Government. M. de Fleuriau is here seen with Mr. Oswald Short and M. Lieutenant de Vaisseau Sala, the French Air Attaché, on board the " Calcutta."
(FLIGHT *Photo.*)

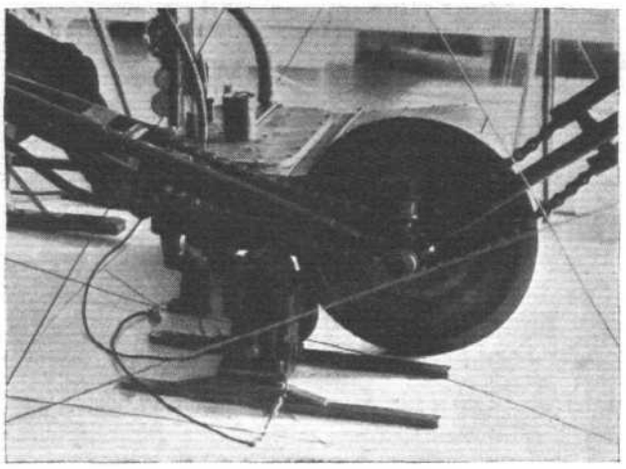
TWENTY-ONE YEARS OF AIRCRAFT ENGINE DEVELOPMENT

By MAJOR F. M. GREEN, O.B.E., M.Inst.C.E., F.R.Ae.S.

Major F. M. Green was Engineer in Charge of Design at the Royal Aircraft Factory at Farnborough from 1910 *to* 1917. *Since that date he has been connected with Armstrong-Siddeley Motors, Ltd., and Sir W. G. Armstrong Whitworth Aircraft, Ltd., of which firms he is now Chief Engineer. Previous to* 1910, *Major Green was, for six years, with the Daimler Company, so that his earliest engineering experience related to internal-combustion engines rather than to aircraft.*

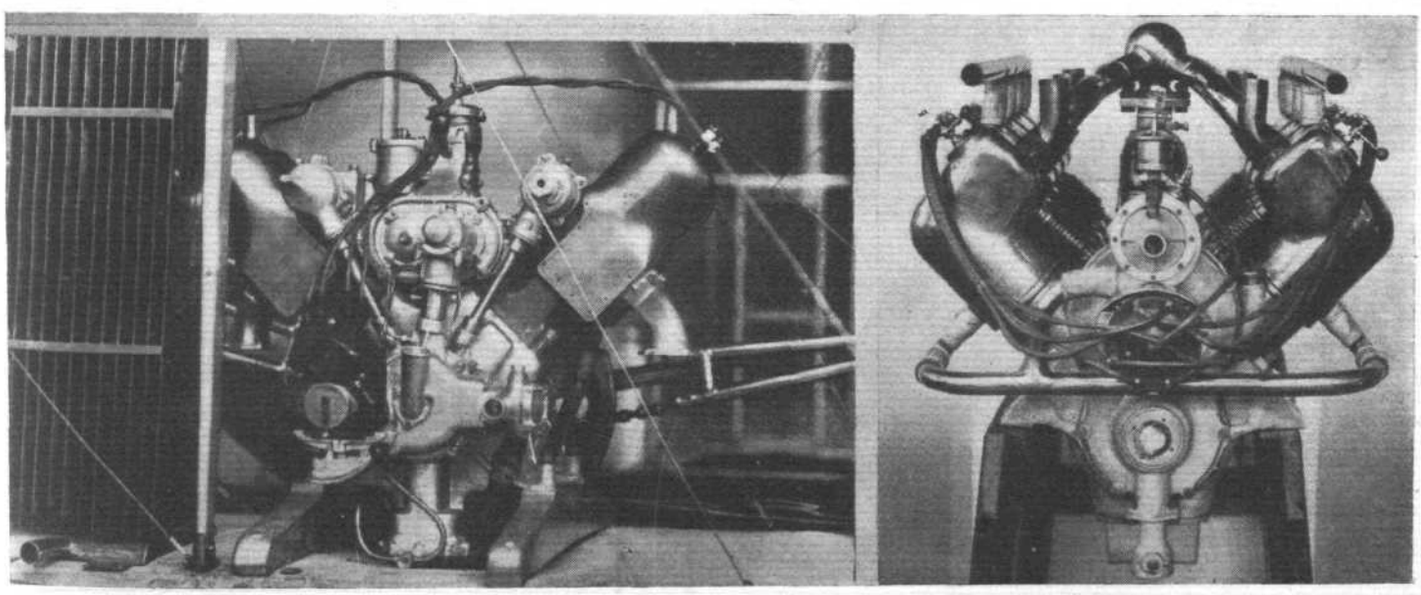
THE history of the aircraft engine during the last 21 years is concerned entirely with the development of the internal-combustion engine and, with very few exceptions, with the four-cycle engine with electric ignition. The use of the steam engine has been discussed from time to time, but it is generally agreed that its limitations are so great as to make it not worth while even trying an experimental installation. The aircraft engine of today is exactly similar in principle to that of 21 years ago, which, in its turn, did not differ from the motorcar engine of a much earlier date.

The Wright brothers used a very ordinary looking 4-cylinder water-cooled petrol engine for their early flights, but this was already out of date 21 years ago and by far the most popular engine was the Gnome rotary 7-cylinder engine of nominal 50 h.p. While today there are in use some exceptional engines giving 1,000 h.p. and more in a single unit, the most widely used engines range from 100 h.p. for light aeroplanes up to 500 h.p. or 600 h.p. on military aircraft and large passenger aeroplanes. Curiously enough, the weight per horsepower of the engines is not so very different from the 50-h.p. Gnome engine. Air-cooled engines are generally one half the weight per horsepower, while water-cooled engines are about two-thirds if we include the weight of the radiator and the water. Progress has been made much more in the direction of increased reliability, accompanied by a decrease in the cost of upkeep and an improvement in thermal efficiency. It was generally necessary to take the early Gnome engines to bits after 15 to 20 hours' running. Nowadays, engines frequently run for 500 hours or more between overhauls.



The "Father" of all aero Engines: The four-cylinder water-cooled engine used by the Wright Brothers in the first machines. (FLIGHT *Photo.*)

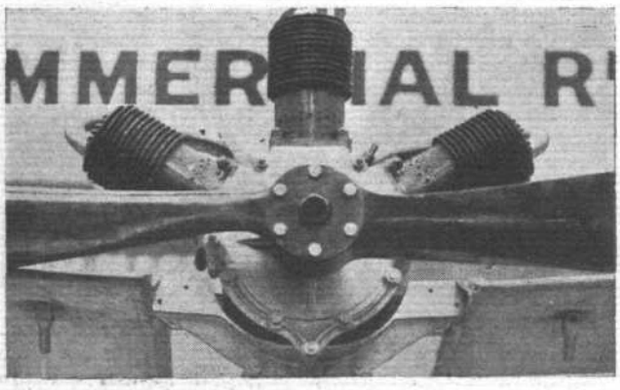
The three chief factors which control the horsepower of an internal-combustion engine are the cubic capacity of the cylinders, the rate of revolution, and the average useful pressure in the cylinder. This latter is generally known as the brake mean effective pressure and is calculated directly from the brake horsepower. It differs from the average pressure taken from the indicator diagram, as it automatically includes an allowance for the mechanical efficiency of the engine. The weight per horsepower of a particular sort of engine is fairly closely proportional to its cylinder capacity, consequently weight per horsepower of the engine is reduced very nearly in proportion to an increase of speed and of brake mean effective pressure. The developments in the last 21 years have been largely to increase these two factors. The 50-h.p. Gnome engine ran at 1,200 r.p.m. with a brake mean effective pressure of about 55 lbs. per sq. in. Present day engines generally run at round about 2,000 r.p.m., and their brake mean effective pressure is normally from 115 to 130 lbs. per sq. in. From these figures one might expect that the weight per horsepower would have been reduced to something less than half that of the Gnome engine. The reason that this is not so is due to the relative increase of weight to ensure greater reliability and length of service. The increase of brake mean effective pressure is chiefly due to an increase of compression ratio and also to improvement in the design of valve gear and carburettors. I do not remember exactly what was the compression ratio of the Gnome engine, but I think it was about $3\frac{1}{2}$ to 1. Present-day engines have compression ratios between 5 and $5\frac{1}{2}$ to 1. For special purposes this is often exceeded, but increase of compression ratio means a loss of reliability or else the use of anti-detonating fuels. The increase of compression ratio automatically gives an increase of thermal efficiency, with a consequent decrease of fuel consumption. Modern engines generally have a consumption of between 0·53 to 0·58 pint per h.p./hour from two-thirds to full power, while this figure can easily be improved by the use of higher compressions when the use of special fuels is permissible. The consumption of the Gnome engine was rather an uncertain



The N.E.C. engine (shown on the left) was a water-cooled two-stroke, four-cylinder vee type. It was used in some very early machines, and is here seen installed in a "Baby Wright" Racing machine. On the right is the E.N.V., a water-cooled vee type with copper water jackets. This engine was used considerably by early British experimenters. (FLIGHT *Photos.*)

figure, but was probably between 0·7 and 0·8 pint per h.p./hour.

The weight of an engine depends to a considerable degree on the arrangement and number of cylinders. The Gnome engine had its seven cylinders arranged radially and in order to ensure cooling the cylinders rotated while the crankshaft was stationary. A disadvantage of the engine was chiefly that its rotational speed was limited by the centrifugal stresses set up in the cylinders. In spite of this, the rotary engine remained popular for a number of years. The horse-power increased by easy stages up to the BR/2 engine of 200 h.p., which did good service in the latter part of the great war. Since then the rotary engine seems to have been entirely abandoned in favour of the fixed radial engine.

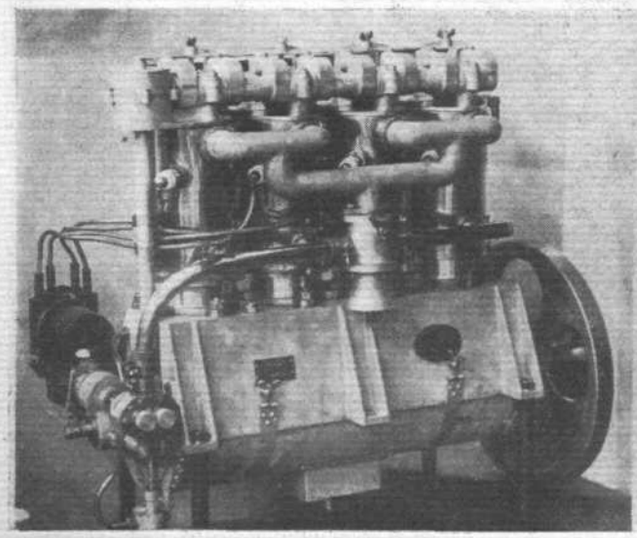


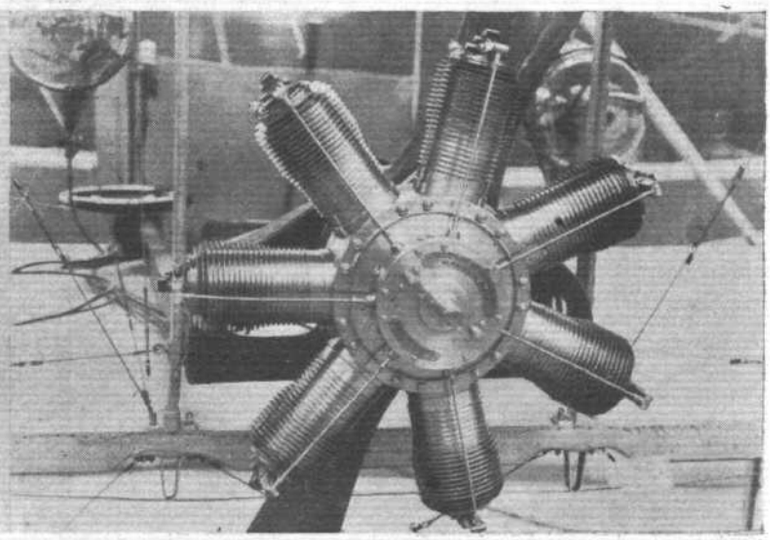
The first engine to cross the English Channel: The "fan type" Anzani fitted in Bleriot's monoplanes was an air-cooled engine. (FLIGHT *Photo.*)

Another early engine which came into use very soon after the 50 h.p. Gnome was the 60 h.p. Renault. This was an air-cooled engine, but with 8 cylinders in Vee driving a 4-throw crankshaft. The engine had cast-iron cylinders and was rather heavily constructed, but it had the advantage of running at 1,800 r.p.m. and working at a brake mean effective pressure of 90 lbs. per sq. in. On account of its higher speed, the airscrew was driven through a spur reduction gear at half the speed of the engine, which made it possible to use a very efficient airscrew. This type of engine was further developed at the Royal Aircraft Establishment in the 100-h.p. R.A.F. 1/A engine, and afterwards in the 150 h.p., 12-cylinder engine known as the R.A.F. 4/A. Both these engines were somewhat similar in design to the Renault, but the brake mean effective pressure was appreciably higher, due to improved cylinder design. The petrol consumption of both the Renault and the R.A.F. engines was not very good, partly because the compression ratio was still comparatively low and also because, owing to the low conductivity of the cast-iron cylinders, it was not possible to run with the best possible ratio of air to petrol without risk of overheating. The average petrol consumption was about 0·65 pint per H.P./hour. In the two years from 1915 to 1917 a great deal of experimental work was carried out on the use of aluminium alloys, first of all for pistons and afterwards for cylinder heads, while at the same time the design of cylinder head was improved by the use of overhead valves. At the end of 1916 an engine was made, known as the R.A.F. 4/D, which was similar to the R.A.F. 4/A in general design but had cylinders of the newer design in which full advantage was taken of the high conductivity of aluminium alloy. This engine gave upwards of 200 h.p. with a petrol consumption of less than 0·6 pint per h.p.-hour, and a brake mean effective pressure of 115 lbs. per sq. in. Only a few of this type of engine were made, but it showed the way to further developments in air-cooled engines because for the first time an air-cooled engine was running with cylinders that were as efficient as the best water-cooled cylinders of that time. The R.A.F. 4/D seemed to be the high-water mark of Vee air-cooled engines and, like the BR/2 it seems to have been the last of its type. The advantages of arranging the cylinders round the crankshaft became apparent and resulted in the development of the fixed radial engine.

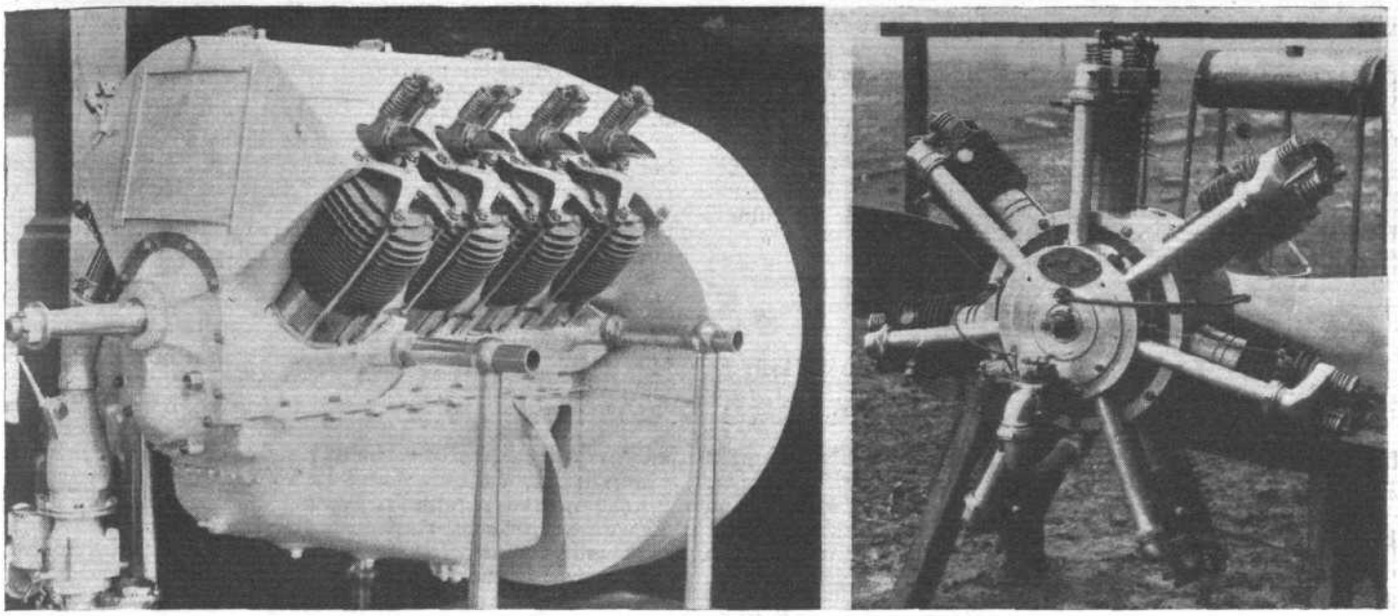
Going back again to early history, the engine that Bleriot used when he made his first Channel flight was a 3-cylinder Anzani, which may be considered as halfway between a Vee-type and a fixed radial. The engine was very soon followed by a large number of true radial engines made by the same firm, and others designed by Viale, who had formerly been connected with the Anzani firm. These engines were not, on the whole, successful, partly, I think, on account of a number of special difficulties connected with radial engines which had not then been solved, and also on account of the comparatively poor design of cylinders. It was not until after the end of the war that the radial engine began to come into its own, particularly in the larger sizes. The Bristol "Jupiter" and the Amstrong-Siddeley "Lynx," "Jaguar," and other engines are so well known that a description of them is unnecessary. It is interesting to know that both the "Jaguar" and the "Jupiter" started as comparatively slow-speed engines, and that the improvement in weight per horsepower has been gained very largely by increasing the rate of revolution, which has eventually involved the fitting of a reduction gear for the airscrew in order to permit of still higher engine speeds. The latest engines of both companies give upwards of 500 h.p. at less than 2 lbs. per horsepower on their normal rated output. The Armstrong-Siddeley company have, in addition, made an engine of similar type which gives 800 h.p. at very nearly the same power/weight ratio.

Before leaving the fixed radial engine, mention should be made of the radial water-cooled engine, particularly those made by the Salmson company during the great war. While the engine undoubtedly gave good service, the type has gone out of favour because it had neither the simplicity of the air-cooled type nor the small frontal area of the water-cooled engine. Water-cooled engines went completely out of fashion in 1909 on account of the success of the Gnome engine.





TWO EARLY ENGINES WHICH HELPED GREATLY TO MAKE FLYING POSSIBLE: On the left the Green, a four-cylinder in-line water cooled, and on the right the famous 50-h.p. Gnome rotary air-cooled. (FLIGHT *Photos.*)



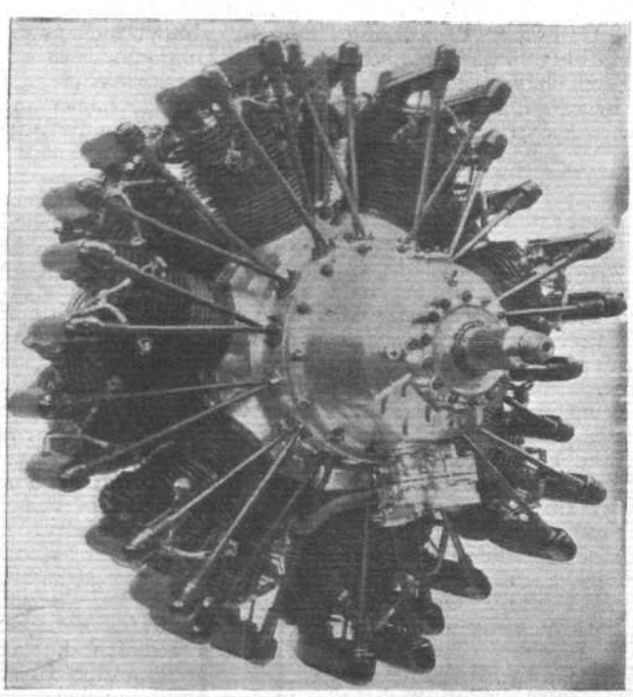
EARLY EXAMPLES OF AIR-COOLED ENGINES: On the left the 60-h.p. Renault vee type, and on the right the Isaacson radial. The former engine was extensively fitted in Maurice Farman biplanes. The latter was fitted in the Howard Flanders biplane at Brooklands, and several flights were obtained. (FLIGHT *Photos.*)

This happened particularly in France and England. Germany and Austria, however, never took very kindly to the ultra-light construction of the Gnome, and the vertical water-cooled engine was developed largely by the Austro-Daimler company and the German Mercedes-Daimler company. About the same time, similar engines were made by the Green engine company in England. While these engines were considered in their day to be remarkable for reliability, it was soon found that the somewhat heavy construction was a severe handicap, and that the Vee-type of engine could be made lighter. The "Antoinette" and the "ENV" were early examples of Vee engines. The former was particularly remarkable, in that it was steam-cooled. The use of aluminium alloy for cylinder jackets resulted in the very neat Hispano-Suiza engine and also the English-made "BHP" engine. The use of aluminium alloy was further developed in the Siddeley "Puma" engine, and this, I think, was the first engine to be made in quantities in which the explosion pressure was taken directly on to an aluminium cylinder head. Meanwhile the Rolls-Royce company produced engines chiefly of the 12-cylinder water-cooled Vee type with steel cylinders and steel water jackets.

Towards the end of the war practically every type of engine, both water-cooled and air-cooled, was in use except the fixed radial engine. Since the end of the war the surviving engines, for large horsepowers at least, are almost exclusively either 12-cylinder Vee type water-cooled or fixed radial air-cooled engines. In the former type may be included the Napier "Lion" engine with its three rows of cylinders. It is true that for small horsepowers the vertical 4-cylinder, air-cooled engine is in common use for light aeroplanes but this, I think, is because the simplicity of the engine is considered to offset its inherently greater weight per horsepower. Otherwise, present-day engines seem to be the logical outcome of the experience of the last 21 years. Higher speeds, higher brake mean effective pressures, are the modern tendency, and the best shape of engine which is suitable for air or water cooling. Higher speed means gear reduction for the airscrew, and for light weight and sweet running the more cylinders the better.

I cannot leave the subject of aircraft engines without reference to supercharging. An internal-combustion engine falls off in power as the density of the air with which it is supplied decreases. Supercharging was first considered in order to keep the horsepower at height comparable with that developed on the ground. A large amount of work was done at the Royal Aircraft Establishment, beginning in 1915. Three types of compressors were tried; a piston type; a Roots' blower; and a high-speed centrifugal blower. Unfortunately, there was so much development work to be done, that supercharging did not come into use during the great war, but what is now known as the Jaguar engine was originally designed to be fitted with a centrifugal type supercharger. For various reasons it made its first appearance as a plain engine, and the real interest in supercharging only began to be revived a couple of years after the end of the war. Since then hundreds of engines have been fitted with a supercharging unit, and the increase of speed of aeroplanes at height has been very largely the direct result of this development. More recently still, what is generally called the ground-boosted engine is coming into favour. This means an engine in which the brake mean effective pressure and, consequently, the horsepower, can be increased at ground level by compressing the mixture before it goes into the cylinder. It is an open secret that both the Rolls and the Napier engines used in the Schneider Trophy race were heavily supercharged, and this, combined with the use of special fuels, was a large factor in achieving the amazing speed at which the race was won.

All the engines I have mentioned hitherto are of the 4-cycle type with electric ignition. There has been very little development of the 2-cycle engine. The only example I can remember which made a public appearance was the N.E.C., a water-cooled engine which was



The modern air-cooled aero engine: The Armstrong-Siddeley "Panther" represents the latest type of which illustrations may be published.

used on the aeroplane flown by Ogilvie in an early Gordon Bennett race. In spite of the simplicity of the 2-cycle engine it has never become successful, chiefly, I think, on account of its low thermal efficiency.

Aircraft engines certainly ought to include airship engines. Originally these were much the same as for aeroplanes, but were somewhat more substantial, and greater attention was paid to fuel economy. The R 101 has what are generally called Diesel engines, but which more correctly should be described as pressure ignition engines. Fuel economy is of the utmost importance on long journeys, and the decrease of fire risk due to the use of heavy oil as fuel is another advantage. Unfortunately, the Beardmore engines fitted to the airship, for various reasons, came out heavier than was expected, and the actual weight is, I believe, 8 lbs. per h.p. While it is probable that pressure ignition engines will be somewhat heavier than petrol engines, I do not think the weight of the engines on R 101 need be taken too seriously.

Finally, I should like to say that this article is not intended to be an exhaustive historical survey. It is rather an account of the engines of which I happen to have had experience myself, and which seem to me to have had the most influence on the development of the aircraft engines used in this country.

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GROWTH OF THE AIR SERVICE

By MAJOR F. A. de V. ROBERTSON, V.D.

"I can trace my ancestry back to a protoplasmal primordial atomic globule," said Pooh-Bah. The Royal Air Force can hardly make quite such an ambitious claim as that. Its family pride may be "something inconceivable," but it does not flaunt it, and it was certainly not "born sneering" like the famous Lord High Everything Else. Nevertheless its family tree is considerably longer than many people imagine, and it may quite fairly be said to trace its ancestry back to a sort of globule. In the case of the R.A.F. the globule was a balloon. Its godfather, if a globule can be said to have a godfather, was a militia officer, Major J. L. B. Templer.

Sir Walter Raleigh, in "The War in the Air," Vol. I, records that a captive balloon was first used by the French at the battle of Fleurus in 1794. Balloons were also used for observation by the French in the Peninsula War and by the Federals in the American Civil War. It may be noted that the first object of aircraft in war was observation, and this continued to be its *raison d'être* until well into the Great War. Bombing and attacks on ground troops were a later conception; and air fighting always was, and doubtless always will be, just a means to the double end of protecting one's own reconnaissance and bombing aircraft and denying the air to those of the enemy.

The Balloon Section, R.E.

The branch of the army which was the mother of the aforesaid globule was the Corps of Royal Engineers. Experiments with military balloons began at Woolwich Arsenal in 1878. One balloon was present at a review at Brighton in that year, and a balloon section took part in army manœuvres in 1880 and 1882. The present Royal Air Force is a direct descendant of that balloon section, and thus it may be said to have an ancestry of quite respectable length.

The balloons of the Royal Engineers first went on active service in Bechuanaland in 1884, but as there was no fighting the aircraft were only useful in impressing the Kaffirs. Next year Major Templer took another section to the Sudan, and some useful reconnaissance was carried out at El Teb and Tamai.

In 1890, thanks to Sir Evelyn Wood, formal recognition was given to the balloon section of the Royal Engineers, which had hitherto carried on in an informal way, and Great Britain became definitely committed to a military air policy. As usual, however, the British army waited for the test of war to point out the proper method of using the novelty. In the South African war it was found that co-operation between the guns and the observers in the air had not been properly worked out, though on one occasion, at Magersfontein, the aircraft turned the howitzers on to the enemy's horses with good effect.

While Major Templer and other enthusiasts laboured to improve the efficiency of the British army air arm, private scientists were at work elsewhere, and both aeroplanes and airships (dirigible balloons they were called) came into existence. Both were naturally very rudimentary, but the progress was watched by the army authorities with interest and sympathy. At first civilian aeroplane pilots were encouraged, and the success of Colonel Cody was mainly due to the help given to him by the army. On another occasion Mr. Robert Loraine took part in army manœuvres in a Bristol machine fitted with wireless. The Bristol company opened a flying school at Larkhill with the blessing of the War Office. Several army officers learnt to fly at private schools.

The Air Battalion, R.E.

At last, on April 1, 1911 (April 1 is the usual date on which the British Empire inaugurates changes of first-class importance, and never troubles to mutter "Absit omen"), an Air Battalion of the Royal Engineers was created by an army order. Officers might be appointed to it from any branch of the regular army, for a period of four years. The other ranks all came from the Royal Engineers. The first commandant of the battalion was Major Sir Alexander Bannerman, a balloon expert. The battalion was divided into two companies: No. 1 Company dealt with airships, and No. 2 Company with aeroplanes.

The Royal Flying Corps

Next year the Air Battalion was changed by Royal Warrant into the Royal Flying Corps, with naval and military wings. Curiously enough, this did not take place on April 1. The warrant was dated April 13, 1912, and the Corps came into being on May 13—two dates much more likely to be obnoxious to airmen than April Fools Day would be.

It is notable that from this early date the Government envisaged one flying service, which should serve the needs of both navy and army. But the Admiralty never liked the idea, and the naval wing of the R.F.C. soon became transformed into the Royal Naval Air Service.

The Royal Naval Air Service

It must be admitted that naval flying dates officially from the formation of the R.F.C. Naval Wing, and that the R.F.C. itself owed its existence to the efforts of military airmen, and was a direct descendant of the balloon sections of the R.E. But it must not be thought that before 1912 the Admiralty and all naval officers had been entirely indifferent to the progress of the air movement. In 1909, the Admiralty gave a contract to Vickers Ltd. to build a rigid airship. This ship, known as the *Mayfly*, after successfully standing her mooring trials in a wind gusting up to 45 m.p.h., was broken when being moved out of her shed. The Admiralty then ceased experiments with rigid airships. It is fashionable now to laugh at this fiasco, but it would be equally sensible to laugh at Lilienthal because he killed himself in his gliding experiments. Plenty of people did actually laugh at "Roe the Hopper." Without experiment there will be no failures and no successes. In the light of later knowledge, the Admiralty seems more culpable for having stopped the experiments than for having made one which failed.

Meantime, two naval officers, Commander Swann and Lieut. Boothby, had fitted floats to an Avro, and in November, 1911, made the first seaplane flight in England. Eastchurch aerodrome was the property of Mr. (now Sir Francis) McClean, and he had two aeroplanes there. On these four naval officers were taught to fly, and later, a naval flying school was established at Eastchurch. Ultimately, McClean presented the aerodrome to the nation.

On the formation of the R.F.C. Naval Wing, the Admiralty got to work in earnest, and appointed Captain (now Rear-Admiral) Murray Sueter as Director of the Air Department. In 1913 all airships, which had previously belonged to No. 1 Company of the Air Battalion, which later became No. 1 Squadron of the R.F.C. Military Wing, were made over to the Admiralty. Capt. E. M. Maitland and most of his airship personnel went over with them. No. 1 Squadron had to be reformed as an aeroplane squadron, and this had not been completed on the outbreak of war. The R.N.A.S. (as it had by then become), thus became possessed of six or seven airships of various patterns. The *Parseval*, the *Astra Torrés*, and the British-built *Beta* all did useful work in the early months of the war. The first naval airship station was Kingsnorth.

From the first, the work of the R.N.A.S. was different and more varied than that of the R.F.C. The former had airships and seaplanes to work with, as well as landplanes. The objects of its air work were also different, and they were duly

tackled in a spirit of enterprise and initiative. The war task of the R.F.C., in the early days of the war, was single, namely, reconnaissance. The R.N.A.S. realised from the first that it must not only reconnoitre, but it must play its part in denying the air round our coasts to hostile aircraft, and in denying British waters to hostile submarines. Its attentions were thus early directed to air fighting and to bombing, and it made the first experiments in adapting aircraft to those tasks. Later on the R.F.C. also took them up, but in the early days of the war the need for reconnaissance occupied more than all its time and energies. It had no leisure to think of anything else until trench warfare had become established.

The R.N.A.S. also showed its versatility by turning to the use of armoured cars when there was a shortage of aeroplanes, and the experiences of Commander Samson's little force of cars at Dunkirk make one of the cheeriest incidents of the war in France. Admiral Murray Sueter also claims that the development of the tank originated with the R.N.A.S. as a result of their experiences with armoured cars. In addition, the Admiralty showed itself more farsighted than the War Office in placing ahead orders for aircraft. In practice, this meant that considerable numbers of naval aircraft had to be made over to the hard-pressed army, and ultimately the competition between the two fighting services in obtaining supplies of aircraft was one of the chief reasons which led to the establishment of the Air Ministry and the amalgamation of the two air services into the Royal Air Force. The present descendant of the R.N.A.S. is the Coastal Area of the R.A.F.

In one respect, the Admiralty failed badly in regard to its air arm. No adequate provision was made for co-operation between aircraft and a fleet in action. The army had been through this experience in the South Africa War, and as a result the R.F.C. started the war with the single fixed determination to act as the eyes of the army. In consequence, the Contemptible Little Army was able to escape from Von Kluck's repeated attempts to work round its left flank on the retreat from Mons. The navy suffered bitterly for its neglect of air reconnaissance. While the Zeppelins enormously helped the operations of the German fleet and several times enabled it to escape from Jellicoe and Beatty, the Grand Fleet seemed content to remain blind, unless information was brought to it by surface craft. Only one British seaplane was sent up at the battle of Jutland, and, consequently, the German fleet was able to escape the destruction which would surely have overtaken it if proper use had been made of our eyes in the air. This criticism reflects, not upon the R.N.A.S., but upon the naval commanders from the Lords of the Admiralty downward.

One should add a postscript to these remarks about Jutland. Beatty had with him one aircraft-carrier, the *Engadine*, from which the one seaplane was sent up. One aircraft carrier, the *Campania*, was with the Grand Fleet at Scapa, under the command of the seaplane pioneer, Capt. O. Swann. Admiral Murray Sueter writes in his book: "I have never yet learned the reason for her absence from the Grand Fleet at Jutland." Mr. H. A. Jones in the second volume of "The War in the Air" says that she never received her signal to sail with the fleet, and only discovered at about 1 a.m. that the fleet had sailed. She started off in pursuit. At 2 a.m. Jellicoe was informed that *Campania* was not with the fleet. She could not then catch it up. She had no escort, and there were enemy submarines about. At 4.36 a.m. the Admiral ordered the carrier to return to port. The incident seems inexplicable, and perhaps this miscarriage of a signal was responsible for the prolongation of the war from June, 1916, to November, 1918. Still, more use might have been made of the aircraft on the *Engadine*.

The R.F.C. in the War.

In a brief review like this, it is impossible to follow the growth of the R.F.C. and the R.N.A.S. throughout the war. The four squadrons of the R.F.C. (Nos. 2, 3, 4 and 5) certainly saved the British army on the retreat from Mons. Later the corps developed the art of reconnaissance still further. Aerial photography and wireless vastly increased its usefulness. Co-operation with artillery was brought to a fine art. The arming of aeroplanes was gradually developed from a pistol or carbine carried by the observer to the Vickers gun which fired through the propellor. Fighting was undertaken to keep enemy aircraft at a distance and to protect our own reconnaissance machines. Bombing, too, was a later conception, and by degrees the aeroplane became a long-range gun. On numerous occasions our aircraft helped the infantry by attacking enemy trenches with machine guns and bombs. There seemed no end to the utility of aircraft. In 1914 army commanders felt a sort of wondering suspicion of air reports. But early in 1915 the battle of Aubers Ridge was postponed for a couple of days, waiting for weather in which the R.F.C. could reconnoitre the German position. In 1918 no major operation would have been undertaken without full reports and photographs from the air. In Palestine the Camel squadrons blinded the Turkish army by keeping all enemy aircraft out of the air, and so greatly facilitated Allenby's surprise attack. When the Turkish army broke, the R.A.F. reduced its line of retreat to a horrible shambles.

The Air Ministry.

As was stated above, the main reason for the formation of a united air force was the competition between the War Office and the Admiralty for supplies of aircraft. The need for one controlling body which would apportion the supplies according to the national need soon became apparent. This need was actually more urgent than the need for a new fighting service to replace the two air arms. In a way, it may be said that the Royal Air Force came as a result of the need for an Air Ministry.

The first step in that direction was taken in February, 1916, when the Derby Joint Air Committee was instituted. It was succeeded in May of the same year by the Curzon Air Board. Then came the Cowdray Air Board in February, 1917. This was a great advance. It was a real Ministry with executive powers, whereas the previous Air Boards had only been advisory committees. Lord Cowdray was in effect our first Air Minister. But by the end of that year the Government had decided upon the principle of a Royal Air Force, and a Bill to legalise its institution was read twice in November, 1917. On April 1, 1918 (one welcomes the reappearance of what is really a propitious date), the Royal Air Force came into being, and the personnel of the R.F.C. and the R.N.A.S. were transferred, with their own consent, to the new force. Lord Rothermere was the first Secretary of State for the Royal Air Force, but on April 25 he resigned, and was succeeded by Sir William (now Lord) Weir. To Lord Weir's ability is due the successful founding of the Air Ministry and the Royal Air Force. From that date until the signing of the Armistice all went well with Great Britain in the air.

The Royal Air Force.

The amalgamation of soldiers and sailors, even though both were airmen, into one fighting service seemed at first to offer great difficulties. On the whole the soldiers welcomed the change and the sailors regretted it. But the experiment succeeded, and the Royal Air Force has been and is a success. Fighting men have certain affections which seem strange and sometimes trivial to the civilian. On April 1 the R.F.C. men merely changed from one pattern of khaki uniform to another, a minor change which they rather liked. The men of the R.N.A.S. had to discard (by degrees) their beloved naval blue and take to khaki, which to them smacked of the army. At first military titles of rank prevailed, and they were strange to the sailors—though a lieutenant who suddenly found himself a captain was usually not dissatisfied. Then the new distinctive blue uniform for the R.A.F. was introduced, and that helped the process of fusion. Finally, after the war, a new set of titles of rank for officers was promulgated, which was based largely on the naval titles. Commander, Captain, Commodore, are all naval titles of rank, and with a suitable prefix they mean the same in the R.A.F. as they do in the Navy. The N.C.Os. retain mainly military titles of rank.

The inventors of the new titles are hardly to be congratulated, for every title is, at least, double barrelled and therefore clumsy, while "Marshal of the Royal Air Force" is a tremendous mouthful. Lieutenants of the army and navy, when not on parade, are content to be addressed as "Mr.," but no one yet seems certain what it is correct for a hostess to say when she hands a Flight Lieutenent or a Squadron Leader a cup of tea. The full titles seem impossibly cumbrous for everyday use, and as yet tradition has not come to the rescue. No doubt it will in time. The main point is that the two original branches of the Royal Air Force have amicably fused, and that a very healthy *esprit de corps* now exists.

In starting a totally new service, various important matters of principle had to be settled. The Royal Air Force is organised on the same lines as the Royal Navy, in that all officers and airmen are on general lists and are available for posting to any unit. The air squadron resembles a man-of-war rather than a regiment or corps of the army. Also, it was decided that what may be called the fighting rank and file should mainly consist of commissioned officers. Both these principles were legacies from the R.F.C. and the R.N.A.S. The latter principle was a complete novelty in the history of British arms. Probably it is a natural

consequence of the original idea that the prime duty of the air is reconnaissance. Observers were of necessity officers, and it happened that the early pilots were all officers. The adherence to this principle has caused certain difficulties to the regular air force. The force needs more pilots than air marshals, and the wastage of peace service does not sufficiently reduce the number of pilots who might aspire to air rank. It has, therefore, been necessary to engage short service officers and medium service officers. It is difficult for these men to obtain civilian employment after five or ten years in the air force, and it seems very doubtful if it will be possible to persist with this policy. The alternative is to make a greatly increased use of airmen pilots, and we scarcely hesitate to prophesy that the future of the force lies in that direction.

AIR DEFENCE

With the formation of the new force a new conception of strategy came into being. It is usually known as Air Defence. It contemplates an air campaign in which possibly neither the navy nor the army will be engaged. In the last few months of the war the Air Ministry despatched to France an Independent Air Force which was not under the command of Lord Haig, though it did conform to the principle by which all British forces in France were under the command of Marshal Foch. Since then, the Royal Air Force has conducted several little wars against savages on its own account. It has taken over the defence of Iraq, Aden and Transjordan. Its Air Staff (which is catered for by an Air Staff College) studies all the problems of air defence as applying to Great Britain as well as to other parts of the Empire.

So important is this subject of air defence, and so specialized a study has it become, that the idea of taking it out of the hands of the Air Ministry and the Royal Air Force is wildly grotesque. Neither the Admiralty nor the War Office could possibly grapple with it. The Air Ministry has certainly come to stay. From the first, the need for an Air Ministry was greater than the need for a single air force, but since then the growth of the study of air defence has made the latter equally essential. Now it seems a matter of less importance whether the air squadrons which co-operate with the army and the Fleet Air Arm are provided by the Air Ministry or by the two older departments. The Admiralty has always insisted that the Fleet Air Arm ought to be an integral part of the navy, and it has succeeded in carrying the greater part of its point. The army, intent on the problems of mechanization, is unwilling to spend anything on the air, and is content to accept the number of squadrons which the Air Ministry allots for army co-operation, although in time of war that number would be ludicrously inadequate for its needs. On manœuvres the army borrows squadrons from Air Defences of Great Britain, though it must well know that in time of war none of those squadrons would be available for army work.

The navy pays for the aircraft which it orders; the army does not. This inaction on the part of the army makes air defence look more costly in the estimates than it actually is. The Air Vote, in fact, pays part of the cost of military defence, which is not as it should be. The present arrangement can only be temporary, and can only be excused by the urgent need of the Army to come to some conclusion on the problems of tanks and other mechanical vehicles.

The trend of events seems to indicate that in time the navy will take over entirely its own air arm, and that the army will be obliged, willy nilly, to take over and pay for its air arm also. The Royal Air Force may face such an outcome with equanimity. No harm will be done to the force or to the Air Ministry by such a development. The essential functions of the Air Ministry are to provide for air defence, to organize the supply of aircraft to all three services, and to maintain flying training schools for all three services. Of these functions there is not the least probability that it will ever be deprived.

THE HISTORY AND GROWTH OF COMMERCIAL AIR TRANSPORT

By CAPT. NORMAN MACMILLAN, M.C., A.F.C., A.F.R.Ae.S.

Capt. Macmillan, Chief Test Pilot to the Fairey Aviation Company, is the distinguished author of "The Art of Flying," "Into the Blue," and "The Air Traveller's Guide to Europe."

COMMERCIAL air transport consists of three main branches—passenger transport, mail transport, and a combination of the two. These may be further sub-divided into national and international lines, regular and occasional routes.

Before the war there was no such thing as commercial air transport. Communication of this nature by air first commenced just before the cessation of hostilities when aeroplanes were used by all the principal belligerent nations for the purpose of swiftly carrying despatches and sometimes personages of importance. This abnormal use of military aircraft was continued by the Allies during the negotiations which followed the signing of the Armistice. From these crude beginnings arose post-war air transportation services for passengers and mails, equipped with military aeroplanes rudely converted into aerodynamically less efficient passenger-carrying aircraft, and the hegemony of Civil Air Transport Regulations was coincident in Europe.

National civil air departments were created, in some countries at a much later date than in others. In Great Britain the Directorate of Civil Aviation was instituted in 1919, whereas in Italy the Italian counterpart was not formed until 1925.

Germany laboured under severe Allied restrictions until 1923, and restrictions less severe until 1926. The first four nations in the field were Great Britain, France, Belgium, and Holland. In those days, when the foundations of the mercantile air futures of many nations were laid, the mortar was mixed of a compound of military, geographical and political necessities which varied nationally in its proportion of constituent parts and thus has proved to each nation to be more or less adequate for the vast increase in commercial air transport which has taken place since. This was a reversal of the process by which naval fleets grew out of the mercantile needs of maritime trading nations, this very inversion of commercial growth being provocative of considerable difficulties in the early years of this latest form of transport. Military requirements, political repression, post-war finances, all made it exceedingly difficult to hoist and keep flying the flag of aerial commerce.

America felt the repercussions of the war also; but in the United States the unity of language and for the first seven years the freedom from all restrictions on flying, coupled with her geographical vastness and the commercial and mileage relations of her industrial and financial centres has led her to an outlook on commercial aviation which is not altogether parallel to that obtaining in Europe. The first United States air mail route commenced operations in 1920, about a year after the inauguration of British and French routes in Europe. The extension of the United States air mail route grew to link that great country east and west by air. Night flying sections were prepared for mail carrying, while passengers using the air route by day and the rail route by night were transported swiftly across the continent. The Government operated mail service run by the Post Office was eventually taken over and run commercially. Feeder lines sprang up connecting towns on either side of the main air line with the transcontinental service. In 1926 the United States instituted regulations affecting public aviation which bear a close resemblance to those pertaining throughout Europe.

The greatest expansion in air transportation has taken place generally throughout the world since 1926. Air lines have been flung from Europe to South America interconnected across the South Atlantic by steamship, from the United States to South America, from England to India, from Moscow to the far East. Every major country in the world is casting its eyes upon the development of long distance air routes, and this very problem is one which will inevitably raise the question of greater reciprocal rights or lead to the commercial barrier of exclusion. No country in the world is today "mistress of the air." In all probability, no country in the world will ever be able to occupy that position, because "freedom of the seas" and "freedom of the air" are two entirely different kinds of freedom. Flying over foreign soil is to the aircraft the equivalent of a vessel sailing within the three-mile limit, but without the ability to get outside that three-mile limit very rapidly as the ship can do. The age of great Imperialistic policies is for ever swept away by the cancer which overtook Imperialism in 1914, and which has continued ever since. Small states may continue to uphold despotism but their policies do not affect the larger nations unless the latter choose deliberately that they should. Thus, in the society of aviation which is continually growing in numbers and in strength, and in which the development of the civil effort is fast outstripping the military, there is evolving a position which, in the near future, may occasion greater unity among the nations of the world.

Allow me to digress for a moment. There are many people who think quite honestly that we should not fraternise with Germans because of the war, people who really believe that German war heroes are *ipso facto* British villains, people who have persuaded themselves that French and British (primarily) warriors fall into an entirely different category to Teutonic warriors. I sympathise with these people. I understand their feelings, but I do not feel the same myself, probably in part because I remember my experience with a German prisoner of war, new-captured in 1916, who was absolutely international in his human side. Language and uniform alone made him German as distinguished from Frenchman or Britisher; the common denominator of war found him otherwise denationalised. My other reason for thinking this is that I have been engaged continuously on the flying side of aviation since 1916 and aviation—particularly non-military aviation—is a wonderful temperer of racial feelings. Through aviation men of antagonistic descent can evince a brotherhood which is above geographical frontier and barrier of tongue. This development can be one of the most important by-products of civil aviation for the whole world. But we shall stand in grave danger of losing nationally this which our aviation *cliques* in each country already possess, if the political authorities of each country do not seize upon international civil aviation as one sure steppng-stone to cross the confluence of the waters of international mistrust and national self-interest. I look upon our own Director of Civil Aviation as an apostle of the new faith, one who, through his appointment and his personality, possesses friends in every country, one who works for aviation unceasingly, one who realises as no one better could that the comity of nations cannot be jeopardised but can only prosper if greater freedom is permitted for the commercial argonauts of the air to pass throughout the territories of the world. The passage of all civil aircraft without let or hindrance would be a great step forward in the political development of flight. At the present moment the barriers to this freedom are mostly those of military and naval restrictions. In nearly every country of the world there are prohibited areas over which aircraft must not fly. Why? Because these areas hide the great secrets, the built-up bases of a country's war forces.

The airman cannot fly straight into Greece from Serbia, cannot fly direct from Vienna to Budapest, cannot fly in a straight line from Sofia to Constantinople. To come nearer home, he must not fly over Portsmouth, Devonport, Chatham, Rosyth, and several other places in Great Britain, at a less height than 6,000 ft. It is only by chance that the prohibited areas in this country are of no hindrance to the commercial aircraft of the country because our one air route to the coast does not approach them. France has prohibited areas, too, and so has every country of importance, while the unimportant ones follow suit. Again, why? Because we still think internationally in terms of war, like the individual people who think that the Germans are not really human. We cling to our old established ideas of armaments, and secrecy about those armaments.

The greatest development which lies before civil aviation is the development of peace. In the realm of international advertising the commercial aeroplanes of a nation may well become greater emissaries than the ships of her mercantile marine, for while the latter are forced to stop at the coastal or river fringes of a foreign country the former can penetrate to the uttermost parts of the earth bearing the credentials of their country among the nations of the world wherever they fly. And everything which tends towards the intercourse of peoples must lead to the elimination of war.

There was a time when the intermarriage of princes and princesses was the diplomatic way to peace and alliance, for the mistrust and suspicion which invariably flourish at

greater distances could be assuaged by the presence of a royal counsellor in the Household.

Today, the reduction of time and distance by wireless and the long-distance telephone, communication by air and the fast steamship, the imminence of television, all of these are making the world smaller and are making it more difficult for evil counsels to prevail undetected in international affairs; they should be making the world a better place to live in. The industry of a nation, its commerce, these are the only sure foundations of its prosperity. A large navy, a huge army, and an imposing air force do not deceive the eye; these three, or any one of them, may be but national sleight-of-hand juggled at the expense of a nation's commercial purse. Since most of the principal nations of the world are now democratic republics, the old way of marital diplomacy must give place to the new way of science, in which commercial air transport is destined to play a very large part. Thus, even in the short history of the commercial air transportation which has grown up in the past ten years no study, however brief, could be complete without some contemplation of the part which geographical and political factors have played in the production of the existing air lines of today.

Commercial Air Transport in Europe

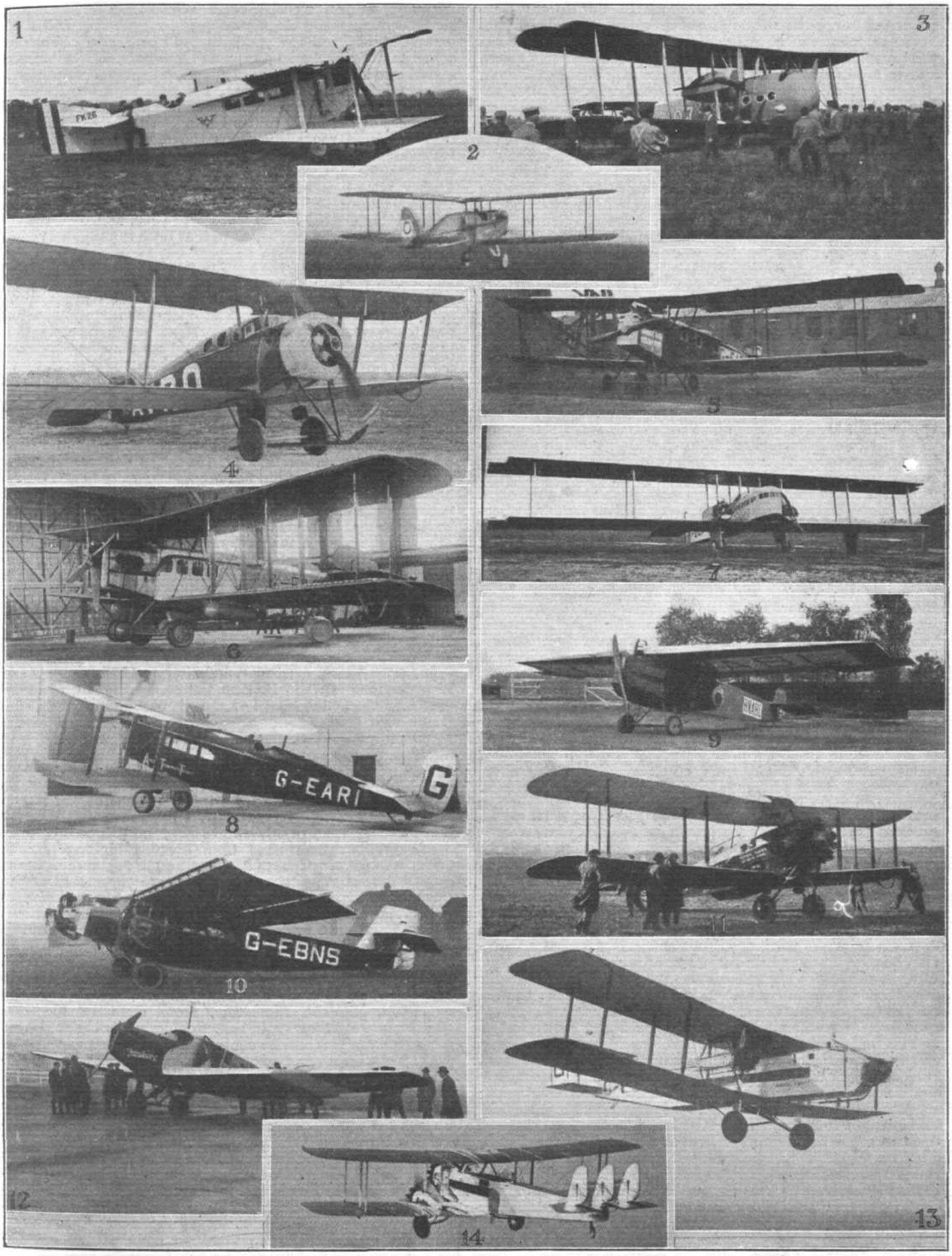
In Europe there are 33 air traffic companies. These are made up as follows: France 6, Italy 6, Switzerland 3, Great Britain 2, Germany 2, Czechoslovakia 2, Germano-Russia 1, Belgium 1, Holland 1, Russia 1, Sweden 1, Denmark 1, Finland 1, Poland 1, Austria 1, Hungary 1, Yugo-Slavia 1, Spain 1. Needless to say, there are very great differences in the sizes of some of these companies and in the air operations in which they engage. In almost all the countries with the small numbers of companies the air traffic activities of the countries concerned are run by monopoiy companies which are responsible for at least the major commercial air operations of the country. In some countries, notably Czechoslovakia and Switzerland, one company is engaged in the operation of international routes while the other devotes its energies to the furtherance of purely national air connections; this policy is very sound because the specialised needs of each company is different, and the competition which the international company has to meet as well as the regulations affecting the flight of its aeroplanes are not in the same category as those under which the national company operates; furthermore, the barter with the companies of any foreign nation for reciprocal flying rights can only take place with the internationally operating company and the purely national flying rights are thereby preserved commercially, irrespective of any international legislation which might exist or be set up. The civil aviation policy existing in France and Italy is not that of other countries; in France and Italy individual companies specialise on certain air lines or territories; over-lapping competition is avoided. There is something in this arrangement which is akin to the *modus operandi* of the British Air Ministry with the British aircraft constructing industry, whereby orders are placed with a view to insuring the continuance of a sufficient number of aircraft constructing organisations as a national asset, a policy which might not always be completely justified on purely commercial grounds. It will be very interesting to watch the future growth of French and Italian civil aviation compared with that of countries whose similar activities are entrusted to a single large monopoly company.

British air lines connect to the main centres of the nearer countries—Paris in France, Brussels in Belgium, Cologne in Germany, Basle and Zurich in Switzerland These lines are terminal feeders to the main continental air system. They are not European trunk routes like some of those of France, Germany, Holland and Russia, and for the principal cause of this difference we have only to look at our geographical situation in Europe, which is unfavourable for the operation of air lines. For trunk route there is the imperially dictated air line running from one of the above cities either via Italy or via central Europe to Greece and on out of Europe via Egypt, Palestine, Iraq and Persia to India. Steps have already been taken to throw a branch trunk line from this route southward to the Cape from Egypt. Air connection from India on to Australia is the ultimate aim of the main line. Feeder connections will link the trunk route to cities on either side of it. Some such connections already exist, for example, the Junkers Persian line connections at Bagdad and Bushire which, in turn, connect with the Russian line flying north to Moscow from Teheran and Baku; others are projected, such as the new connection to be run between Karachi and Bombay. By the time this article appears in print the eastern terminal will be Delhi, the capital of India, and not just Karachi, its air port of entry. It is unfortunate that this air line, running vertebrate throughout the length of the British Empire to the east, with feeder lines like nerve cords which will interservice the remoter parts lying off the direct track, does not include Canada. To embrace Canada in any British Empire air service scheme is a problem infinitely more difficult to solve than that of all the other parts of Empire, the more so because Canada borders her frontier southwards where she does. It is easy to interpret the geographical and political necessities which have determined the British air lines of today. In addition to the outline given above, there is also an independent organisation interconnecting Southampton and the Channel Islands, which I have counted when enumerating two air transport companies to Great Britain.

When we turn to France we find her numerous companies specialising in certain territories. Two companies run competitive lines against British, Dutch and German companies; two more run services which at present are free from competition; two more run services which are mainly, but not entirely, centred in French territory. French air lines reach out to Sweden, Poland, Constantinople, Tunisia, Morocco; French aeroplanes fly to London, Amsterdam and Berlin. In her own territory she inter-connects Paris with Strasbourg, Lyons, Marseilles, Bordeaux, Biarritz and other places. Her Constantinople line will eventually reach Bagdad via French Syria. Her line to Morocco carries passengers as far as Casablanca and then flies southwards to Senegal with mails which are shipped at Saint Louis for South America, while the aeroplane passes still further south to its present terminal in Africa, Dakar. The train leaves Paris on Saturday night, connects with the aeroplane at Toulouse on Sunday morning which, flying via Spain, reaches Saint Louis and Dakar on Monday evening; the steamship leaves Saint Louis on Monday evening and reaches Natal in Brazil on Saturday; Rio de Janeiro the capital of Brazil is reached from Natal by aeroplane on Sunday evening, and Buenos Ayres, the capital of the Argentine, on Monday evening nine days after leaving Paris. From Buenos Ayres connections run to Asuncion in Paraguay and Santiago in Chili. A further projected route branch is from Natal to Cayenne in French Guiana. The total flying mileage of the route from Paris to Buenos Ayres alone is very little short of 7,000 miles. This French air mail route is in its conception perhaps the most striking air mail route in the world today. Internal mail connections in France, and an air service in French Indo-China complete this extremely brief survey of the activities of French commercial aircraft. It is of no small importance that apart from the French air competition in the linking up of the countries which lie about France the main effort of her commercial air transportation is undoubtedly directed towards the inter-connection by air of the French colonies and the Latin races throughout the world, with the exception of Italy.

German aviation is all commercial transportation. The conditions imposed upon her by the war and its aftermath have decided this without option. It is true that all German design is not free from the desire to produce types which could be converted to military purposes, but this article treats of operational aviation, not constructional. Next to the large number of her air routes and the high mileage flown by her air lines, the principal feature of German commercial aviation lies in its centralisation. Around Leipzig as a rough centre, her air lines lie thick upon the map. As one would expect, they take Austria, Switzerland, Holland, Denmark, and the nearer Baltic cities in their web. Every little while a line reaches farther out to a more distant terminal point—Budapest, Marseilles and Barcelona (German trade with Spain was always good), Paris, London, Oslo, Stockholm, and via the Russo-German line to the Eastern Baltic States, Leningrad, Smolensk, and Moscow. The urge behind the post-war development of German commercial aviation will cause her to turn her eyes to the inauguration of long-distance routes. With her present lack of colonies, German trade enlargement must turn to methods of peaceful penetration by the establishment of German commercial colonies in foreign cities, and by the planning of air mail routes between Germany and the cities where her trade is most prosperous; it is a condition consequential upon the stripping from her of her colonies and the hedging in of her national boundaries; it is a development which is political and commercial, bred in the same forcing-house as that which brought her present territorially-more-restricted commercial aviation to its present flourishing condition. It is significant that German commercial air transport is financed by the large banks and shipping companies of the nation, and that its object is trade development first and foremost.

The remainder of the air lines of Europe are mostly local. They serve to connect the large cities of each of the European



EVOLUTION OF THE COMMERCIAL AEROPLANE. 1, the Koolhoven F.K.26; 2, the D.H.4 with cabin roof added; 3, the Vickers "Vimy-commercial"; 4, the Avro Coupe; 5, the Sopwith Antelope; 6, the Westland limousine; 7, the Farman Goliath; 8, the D.H. 34; 9, the Fokker F.II; 10, the Handley Page "Hamlet"; 11, the D.H.50 J; 12, the Junkers; 13, the Armstrong-Whitworth Argosy; and 14, the D.H. Hercules. (FLIGHT *Photos.*)

countries with each other internally in their own countries and internationally with the contiguous lines of neighbouring countries. Some of these lines deserve particular mention. For example, the Scandinavian Air Express transports the traveller from London or Paris to Stockholm in 24 hours, and to the capital of Finland in 30 hours. This is a Dutch, Swedish, Finnish combination, the necessity for the combination well-illustrating one of the difficulties under which commercial air transport has grown up in Europe, particularly in the atmosphere of post-war feelings which have not always made for the easy adjustment of difficulties between air operating companies. Another important cross-line in European air transport is the Dutch-Czechoslovak route from London to Prague. The Italian and Austrian air lines which speed up communications between Rome, Venice, Vienna, and Berlin are of great value in middle Europe; while the Italian line from Brindisi to Constantinople via Athens is also important. The operation of Italian air lines in Albania is politically interesting as is the dearth of air communications between Italy and France, there being only the connections between Genoa and Marseilles, Milan and Monaco.

Before leaving this brief study of European air transport, it is necessary to make some reference to the variation in routes between summer and winter. Owing to the very bad conditions which exist in parts of Europe during the extreme winter months some of the air routes shut down completely, while others fly reduced services. For example, the Deutsch Luft Hansa reduced their services from 67 routes to 14 routes on November 1, 1929, the winter service continuing to operate until February 28, 1930. During this period of reduced flying activity, the companies take the opportunity to overhaul the aeroplanes which are put out of commission. It is a normal condition of the operation of all forms of transport, ground, sea and air, that bad weather can interfere with regularity of running. Shipping may be frozen-in, railways may be snowed-up, and aircraft may be weather-bound. Further extensions of ground organisation and of meteorological services will ameliorate but will not eliminate these conditions for aircraft. As communications become faster, the effect of the slowing down of winter conditions will become more apparent and trade and living generally will tend to become ever more seasonal. It is all a question of degree. In Canada, for instance, the settling down of real winter spells a diminution of activities to the point almost of cessation. One can imagine a constantly progressing world some day transporting the drones of industry *en masse* to more southerly latitudes during the winter months to enable production to be maintained at a rate which the needs of humanity dictate. But this, I am afraid, is a step beyond our present stage of capitalised industrialism. It is not, however, beyond the present possibilities of the operation of modern aircraft that in the weatherbound days of the more northerly latitudes their routes might be diverted to other and more southerly latitudes or even to the southern hemisphere where their work could be maintained to serve the needs of other countries.

American Air Transport

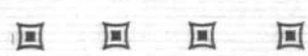
The geographical layout of the United States of America determined the type of service which aircraft could render to the country. The industrial middle east around Chicago had to be connected to the financial centre of New York. Every minute saved on this run saved the interest on bills, cheques, and money in transit, which, during the time it was passing from one city to the other was earning nothing. The speeding up of letter communication was also important between these two great centres. Now if Birmingham stood on the Pentland Firth, its distance from London would then be roughly equivalent to the distance between Chicago and New York; the need for air communication between Birmingham and London would have brought an air mail service between the two cities into being soon after the war; that was the deciding factor in the commencement of the air mail service which was commenced by the United States post office in 1920. By 1926 this service ran across the breadth of the continent from New York to San Francisco, a distance of some 2,665 miles, and was lighted for the first 2,000 miles out from New York. The day and night service which first commenced in 1924, with the establishment of lighted route sections, reduced the time for the whole distance to 36 hours, against the four days required by rail transport. In 1926 there was a single daily service each way and a day and night service between Chicago and New York. The post office has ceased to be the active operator of the air mail aeroplanes in the United States and their actual operation is now carried out by contractors. The New York-San Francisco air line is the backbone of the air routes of the United States, and most of her other routes run north and south, and feed into the main route. Perhaps the most important of the transverse routes are those which fly parallel to the eastern and western seaboards. There is a transverse air route farther inland running from Chicago to Florida, there are air connections to Mexico City, and air routes in operation between the United States and Porto Rico, and to South and Central America via Cuba, as well as lines running northward to the frontier of Canada.

Her great distances, the continuity of land north into Canada and south into Mexico and South America offer the possibilities of air transport development which are not yet quite at the degree of route and operational stability which has been achieved in Europe. Next summer's operations in the United States, however, should see the commencement of the stable solution of the problem of air transport by the determination of more regular schedules over established and profitable routes. Europe announced her policy regarding public air transport by the signing of the International Convention on October 13, 1919, while the International Commission for Air Navigation was set up under the terms of the Convention on July 11, 1922. In the United States, the Air Commerce Act did not become operative until December 31, 1926. Prior to that date, public air transport as it had already come to be known in Europe, did not exist. This difference in date in the setting up of the legal machinery of air traffic regulations gave an opportunity to stabilise the public air transport of Europe while the United States had yet to make a declaration of definite policy affecting the country as a whole. The rapid strides which have been made in the last three years are due to her unity of language, commercial prosperity and geographic vastness.

Other Air Activities

In South Africa, Australia, and New Zealand, air routes are in operation. In the Belgian Congo, in French equatorial Africa, in the Dutch East Indies air routes fly with regularity. On the continent of South America, over the steppes of Russia, the aeroplanes of commerce cleave a passage through the air.

At the end of the first decade of air transportation we have learned many lessons. We have found that it was necessary to break away from the traditions of war aircraft for the purposes of commerce. We have seen that the satisfactory operation of air routes was built upon prepared organisation. There have been evolved landing grounds, beacons to guide 'planes in darkness and in fog, automatically-operated wireless position signal apparatus, special aerodrome night lighting equipment, directional wireless to bring the pilot flying above clouds to his destination; rules and regulations have been framed from which a working code has been produced; aeroplanes have steadily been improved, the public has become accustomed to the mere act of flying and it is now no longer a novelty; instruments have been devised to assist the pilot, more are being experimented with—turn indicators, horizon indicators, more sensitive altimeters recording to 5-ft. intervals, leader cables are being developed, the gyroscopic automatic control is an accepted accessory of flight; meteorological co-operation with aircraft has reached a standard of the highest utility on air transport routes; landing gear has been improved, safety in regard to stalling has been effectively dealt with, the number of passengers carried per aeroplane has been greatly increased as has their comfort; regularity of flight is now very high; the desirability of separating air mail transportation from passenger air transport has been recognised in many quarters; the strongly marked difference between military and civil aviation has been made apparent. This is a record of ten years. It is a very wonderful record. If the next decade shows advances comparable with those we have witnessed in the past ten the dawn of the real air age is here.



TWENTY-ONE YEARS OF WATER-COOLED ENGINE DEVELOPMENT

By LIEUT.-COL. L. F. R. FELL, M.I.M.E., F.R.Ae.S.

Lieutenant-Colonel Fell was, during the war, in charge of the R.A.F. Engine Repair Section in France, and after the war he became Assistant Director (Engines) in the Department of the Air Member for Supply and Research. Colonel Fell is now with the firm of Rolls-Royce, Ltd.

THE years 1909 and 1910 were ones of great activity in water-cooled engine design. Almost all known cylinder arrangements seem to have had their supporters—horizontal, radial, "X" and "V" types, also engines with vertical cylinders arranged in line were all under construction. In some cases weights as low as 2 lbs. per horsepower were claimed, though the horsepowers were only estimations and were probably very far from what were actually obtained. The average weight per b.h.p. seems to have been about 6 lbs. With the exception of the famous Green and Wolseley engines, the remaining types were almost exclusively of French origin. Not one of these early engines seems to have survived up till the European War in 1914, with the exception of the four-cylinder Green, which, with considerable modifications, was actually flown in a light aircraft some time after peace had been declared.

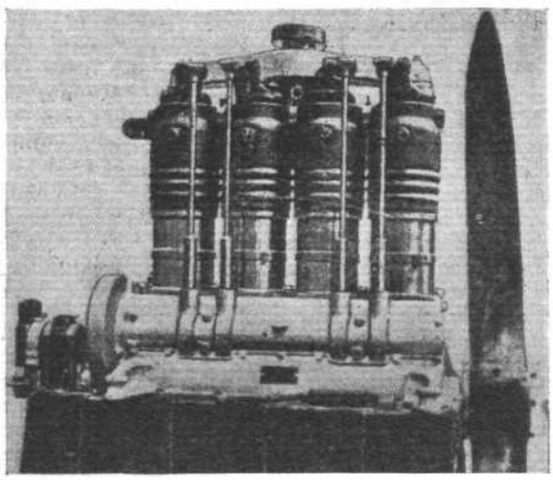


Fig. 1. The 4-cylinder 35-h.p. vertical Panhard engine. (*From "Aero Engines," by G. A. Burls*)

Twenty-one years ago, the four-cylinder vertical, eight-cylinder "V" and horizontal types were the most popular, and Fig. 1 is a typical example of the first-named type. This is the 35-h.p. "Panhard," which had a bore and stroke of 4·33-in. and 5·552-in. respectively. Its weight is given as 9·5 lbs. per b.h.p. The cylinders of this engine were of steel with cast-iron heads and, as was the general practice at that time, the water jackets were of copper secured by screws and solder. The pistons were of cast iron.

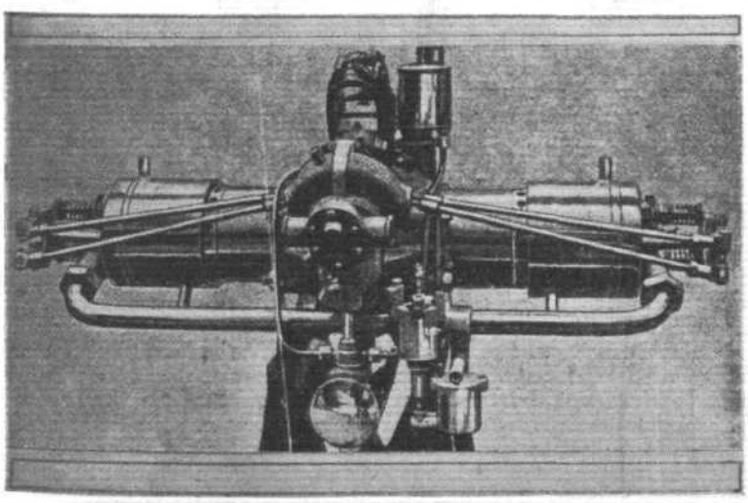
As an example of an eight-cylinder "V," the 50-h.p. Wolseley gave good service in its day. The Wolseley Company actually entered the aircraft engine manufacturing field two years prior to 1909, and, therefore, had some considerable experience by this date. This engine had a bore and stroke of 3·75 by 5 in., and the propeller ran at camshaft speed, the half-time gear being made suitable for this purpose as was the standard practice on so many subsequent engines during the early part of the war period.

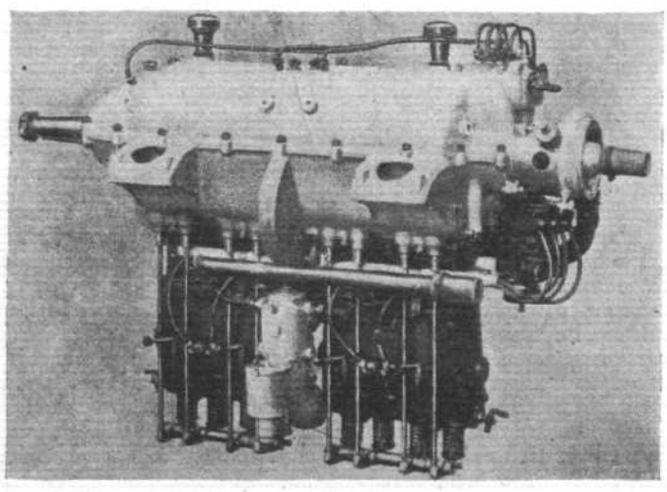
Fig. 2 illustrates the Darracq horizontal engine. This engine had a bore and stroke of 5·12 in. by 4·73 in. and gave 25 h.p. at 1,500 r.p.m. It was with this engine that Santos Dumont made his historic flight from St. Cyr to Buc—a distance of about 10 miles—in 15 mins., in his aircraft "Demoiselle." The interest in this flight lay in the fact that the machine was the smallest that had at the time actually succeeded in flying. As in the type of engine illustrated in Fig. 1, practically the same form of cylinder construction was employed.

In 1911 the first of the famous German Mercedes-Daimler and Benz engines made their appearance. These were constructed with four-, six- and eight-cylinders in line. In the Mercedes engine, the cylinders were cast in pairs, at first complete with jackets, but subsequently welded sheet steel was substituted for the jackets in order to save weight. The Benz was supplied with separate cast-iron cylinders and welded jackets. The direct descendants of these pioneer engines served the Germans in a highly satisfactory manner throughout the whole of the war. The weight of the six-cylinder, 100 h.p. Mercedes was about 4·8 lbs. per h.p.

About this time the Austro-Daimler six-cylinder engine came into existence. In these engines cast-iron cylinders were used, but a departure from previous practice is notable in the jackets. These were electrolitically-deposited copper. The engine was originally designed as 120 h.p. Colonel Cody won the Military Competition in 1912 with one of these engines. At the time, the weight was 4·8 lbs. per b.h.p. The 120-h.p. engine and the 160-h.p., which was developed from it, were used throughout the war by the British Air Service, and gave very good results as manufactured by Messrs. Beardmore.

It was in 1913 that the first inverted engine was constructed. This was the four-cylinder, 70-h.p. German Daimler, and is illustrated in Fig. 3. The reasons put forward in favour of this design at the time were that it improved the pilot's view and also the inversion was an advantage in securing improved water circulation. Many times since that date the same arguments have been put forward in support of the inverted engine, and Messrs. Beardmore, at a comparatively recent date produced experimental inverted six- and eight-cylinders-in-line engines. It seems, however, that the policy of inverting engines is only to be recommended if they are of the "in line"





On the left, Fig. 2.—The 2-cylinder horizontal opposed water-cooled Darracq engine. On the right, Fig. 3—The 70 h.p. 4-cylinder inverted Daimler engine. (*From "Aero Engines," by G. A. Burls*)

type and, for various constructional reasons, it seems unlikely that this form of aircraft engine will be perpetuated, except for small powers.

Mention must here be made of the 120-h.p. Green engine which won the Naval and Military Aero Engine Competition in 1914. This engine had a bore and stroke of 5½ ins. by 6 ins., and weighed 3·67 lbs. per b.h.p. Forced lubrication to the crankshaft was employed, which at that date was not usual, the German and other foreign straight-line engines being

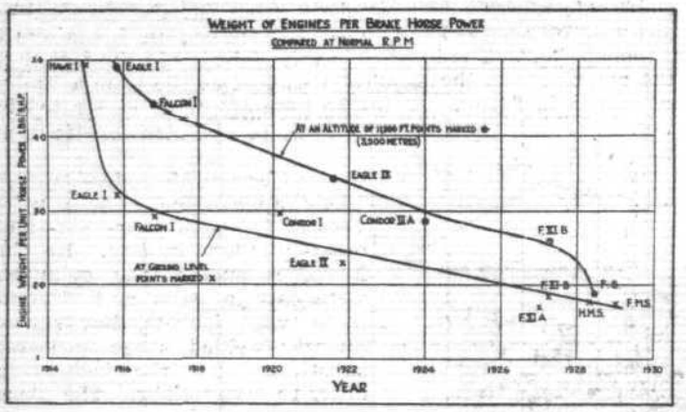


Fig. 4.

provided with separate oil pump feeds to each point without circulation. In spite of the fact that the Green engine seems to have been a successful type, very little use was made of it, and it was never put into production during the war. Almost throughout the period 1914 to 1918 there seems to have been a marked preference by the authorities for non-British engine designs and, with the exception of the Rolls-Royce engines and later the Siddeley "Puma," the water-cooled engines in use by the British Air Service were exclusively of foreign design.

At the commencement of the war, the water-cooled engines in British service were the Austro-Daimler 120 h.p., and the Canton Unne Salmson water-cooled radial. The latter was fitted with nine steel cylinders machined all over, supplied with spun copper water jackets brazed on. The engine was made in two sizes, 110 and 130 h.p. The method of taking the reaction on the big end so as to dispense with the use of a master rod was a special feature of the design. This was done through a train of gears operating through the crank web. The engines were used in Voisin machines, completely enclosed in the fuselage—incidentally entirely surrounded by wood. It was the usual practice when sending them for overhaul to saw off the tail-end of the machine, remove the planes and send the remainder of the fuselage complete with the four-wheel undercarriage to the base workshops for them to extract the engine. From the overhaul point of view, the great disadvantage of this type was that all the nine cylinders were different, owing to the arrangment of the water branches in the jackets to get correct circulation. It was claimed for the engine that it would run for 30 mins. without water, and the writer actually saw one which had performed this somewhat remarkable feat. The temperature of the crankshaft ball-bearings had reached such a point that the balls had become welded together.

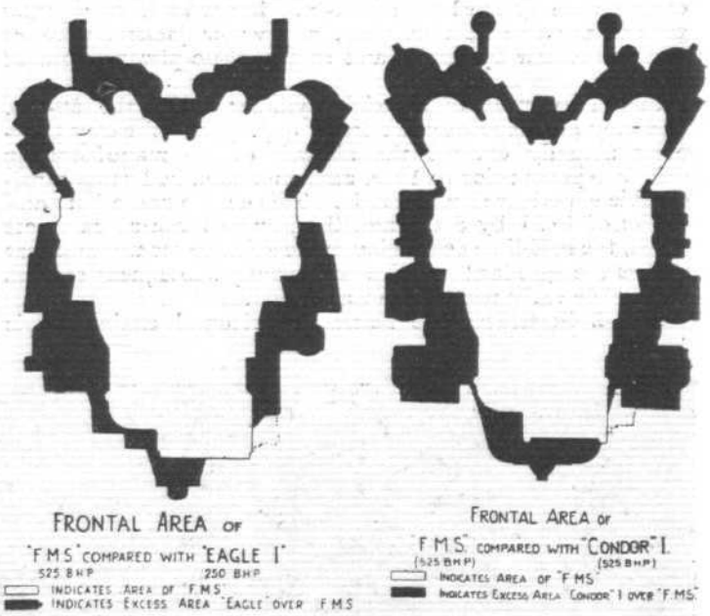
It was not until the beginning of 1915, when the first shock of the war was over, that aircraft engine development really got going in this country. The first of the Rolls-Royce "Eagles" was, however, on the test bench by the end of 1914, having been put in hand by the Admiralty in September of that year. This engine was generally looked upon as complicated with its forced lubrication and four carburettors, but it has since formed the basis for all water-cooled engine practice right up to the present day. Early in 1915 the "Eagle" was followed by the "Hawk" and the "Falcon." It is of interest to note that by the end of the war there was a greater horsepower of Rolls-Royce engines in service than of those of any other maker in use by the Allied Forces. The all-steel cylinder construction of the Rolls-Royce engines was first suggested to Mr. Royce by a Mors racing car which he used to drive in the early days of his association with the Hon. C. S. Rolls, himself a pioneer of aviation.

It was in 1915 that the Hispano-Suiza Company first produced their celebrated eight-cylinder "V" type engine. This gave 150 h.p., and weighed 3·07 lbs. per b.h.p. The great success of this engine is considered to be due to the fact that its designer was the first to appreciate the value of the use of cylinder blocks as stiffening girders to the crankcase, at the same time effecting a large saving in weight and producing a very smooth-running engine. The construction of the Hispano engine is so well known that it is unnecessary to give space to its features in this article. The engine was rapidly developed to give 180 h.p. as an ungeared engine, and later, with gear reduction, up to 220 h.p. As made by the better French manufacturers and by Messrs. Wolseley, the engine was unquestionably a great success and was very widely used by the British, French and American Air Services, especially in high-performance aircraft such as the S.P.A.D. and S.E.5. It required, however, careful manufacture so far as the screwed in cylinder liners were concerned, and also in the construction of the oil pump, which was of the somewhat unusual eccentric vane type.

At the Engine Repair Shops in France no less than eight different manufacturers' engines had to be overhauled, and no two manufacturers' engines were truly interchangeable. Owing to the shortage of spares, this, of course, greatly complicated the work and called for the services of a very much larger plant than would normally be considered necessary for engine overhaul in the field.

It was during 1915 that the B.H.P. (Beardmore-Halford-Pullinger) was first constructed experimentally to the general designs laid down by Capt. Halford, who was at the time with the Aeronautical Inspection Department. As at first designed, this six-cylinder in-line engine was produced with hemispherical combustion chambers with a closed-ended liner similar to the Hispano. It was found, however, difficult to secure a satisfactory metal-to-metal joint between the hemispherical head and the aluminium water jacket, and the cylinder was therefore re-designed at Messrs. Siddeley's with cast aluminium block and an open-ended liner with screwed-in valve seats. As re-designed, this engine went into big production, was known as the Siddeley "Puma," and was most successful. Many are still in service.

It was in 1916 that the first of the now famous Napier triple four-in-line engines was produced to the designs of Mr. A. J. Rowledge, under the direction of Mr. Napier. It was unfortunate for the British Air Service that the outstanding merit of this design was not appreciated by the authorities until the war was practically over, in consequence of which the Air Board support was not as intense as it might have been, and Messrs. Napiers energies were dissipated on less profitable ventures. The world-wide success of this engine, apart from the excellence of its design, is unquestionably in a large measure due to the perfection of workmanship—second to none in the world—secured under the direction



Figs. 5 and 6.

of the late chief engineer and technical director, Mr. George Pate, who is now with the Albion Company.

Though it is now a matter of history that the progress in design and performance of the British aircraft engine between 1914 and 1918 was unparalleled in the history of mechanical engineering, it can be shown by analysis of the results obtained at the present day that this progress has been well maintained in the last ten years.

The ideal aircraft engine is one in which reliability is combined with minimum weight, minimum frontal area and

minimum fuel consumption. The progress which has been made towards the production of the ideal engine can best be indicated by a series of diagrams and curves. The diagrams and curves are based on the production of one British firm as these are readily available to the writer, but by no means represent isolated cases, and similar results of an equally astonishing nature could be obtained by taking as examples the production of other well-known British aircraft engine constructors.

Weight Reduction

Fig. 4 shows that since 1915 the weight per b.h.p. has been reduced by about 50 per cent. so far as power at ground level

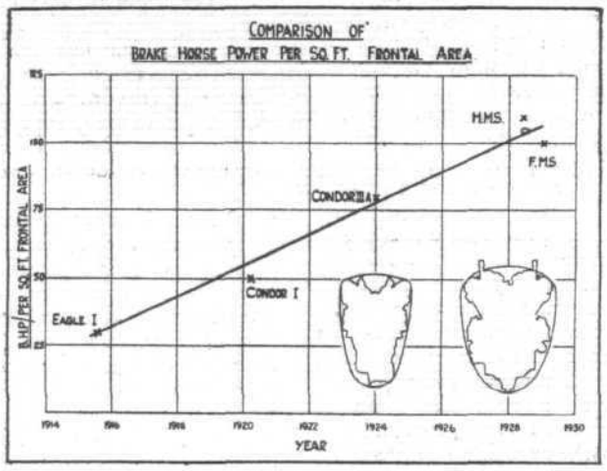


Fig. 7.

is concerned. Owing to the introduction of the supercharger, at an altitude of 11,500 ft. it will be seen that the output obtainable from a modern engine is more than two-and-a-half times that which was found to be possible 15 years ago from an engine of a given weight.

Reduction of Frontal Area

Fig. 5 compares a 250-h.p. engine of 1915 with one of 1929. Fig. 6 compares two 525-b.h.p. engines, one the production of 1918, and the other belonging to the present day. This comparison, it is thought, is very striking, and if we refer to Fig. 7 it will be seen that it is now possible to obtain four times as much power from a given frontal area as it was 15 years ago.

Reduction in Fuel Consumption

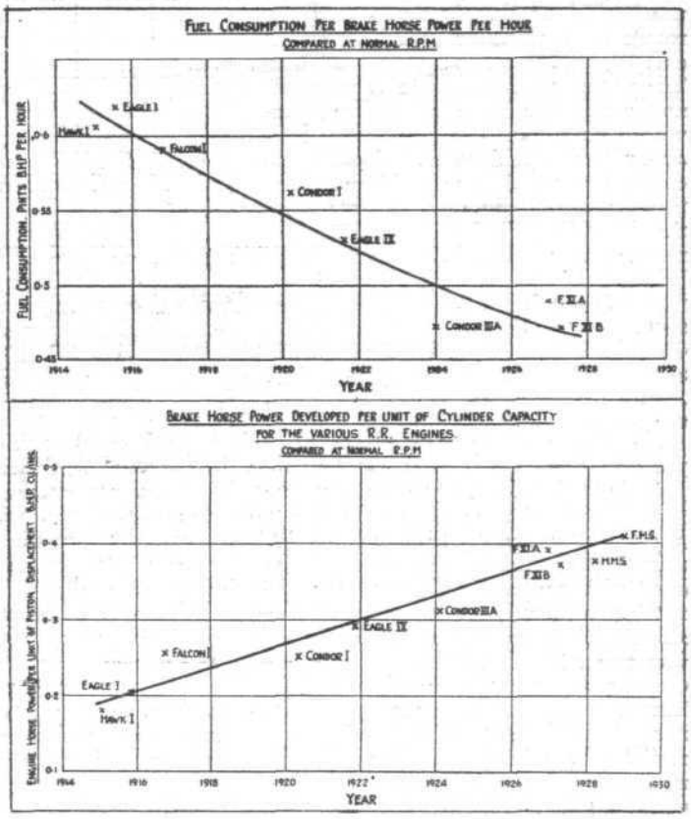
Fig. 8 shows that the amount of fuel it is necessary to burn to produce a given horse-power is now 25 per cent. less than it was in 1915.

In Fig. 9 it will be clear how it is that these great strides have been made in the reduction of weight and frontal area of the modern engine. Brake horse-power developed per unit of cylinder capacity at the present date is double that which it was found possible to obtain 15 years ago. It will be seen that the curve 5 shows no sign of flattening out, and that therefore, in the next few years we may reasonably expect the present rate of progress to continue for some time yet.

It is thought that the curves illustrated are sufficient indication without further comment of the present position of the water-cooled engine.

These happy results have only been brought about by the most careful and continuous research in the laboratory and on the test bench, both in the improvement of materials and the advancement of design technique.

As has already been indicated, a very great deal of work has been done in this and other countries with superchargers. After long experiments with all types, the geared centrifugal blower has been found to give the most satisfactory results from every point of view.



Figs. 8 and 9.

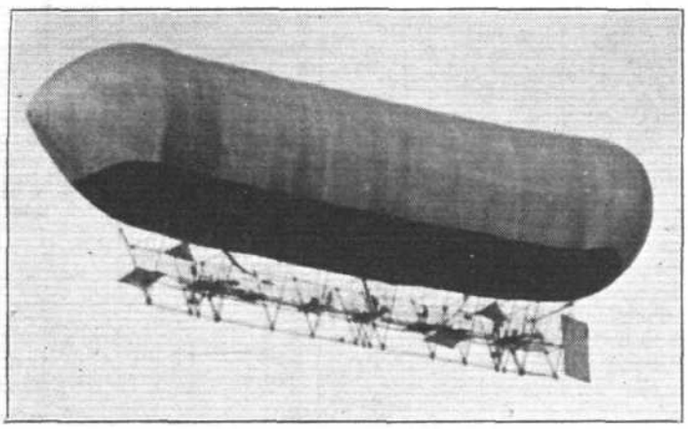
It is not possible in the course of a short article adequately to do justice to the almost incredible technical progress which has been made in the design of water-cooled engines in the last twenty-one years. Perhaps it is a fitting climax, however, to give particulars of the engine which won the Schneider Trophy in 1929 for comparison with the engine described in the beginning of this article :—

	35-h.p. "Panhard."	Rolls-Royce "R."
	lbs.	lbs.
Weight per b.h.p., approx. ..	9·5	0·75
B.h.p. per cub. in. of cylinder capacity	0·09	0·9

TWENTY-ONE YEARS OF AIRSHIP PROGRESS

By LIEUT.-COL. W. LOCKWOOD MARSH

THE state of airship development about the time FLIGHT started its existence, apart from Zeppelins, which were further advanced than airships in other countries, cannot, perhaps, be better summarised than by quoting the specification issued early in January, 1909, by the French military authorities of their requirements in designs to be submitted to them for the supply of new airships for the French army. It was stated that the airships would be required to maintain a speed of 31 miles an hour for 15 hours, carrying a crew of six, with an average weight of 165 lbs. They were to be capable of reaching a height of 6,500 ft., and were to have a maximum volume of 230,000 cub. ft., with a maximum length of 297 ft., maximum height of 66 ft., and maximum diameter of 28 ft. Perhaps the most significant of these figures was the difference of 38 ft. between the maximum diameter and the overall height, as this represents, allowing for the height of the car (which would probably amount to some 10 ft. at most), the distance below the envelope at which it was in those days found necessary to suspend the car of a non-rigid airship.



Before 1909 : The Barton airship antedated FLIGHT by about nine years, having been produced round about 1900. (FLIGHT *Photo.*)

On December 24, 1908, the French President (Monsieur Loubet, who has just died) had opened the second French Automobile Salon, which contained almost as many aircraft as motor-cars. Slung from the roof in the centre, and dominating the building, was the *Ville de Bordeaux*, a Clément - Bayard airship. Like most of its contemporaries, except for the semi-rigids of the Lebaudy type, it was strikingly reminiscent of the Rénard airship built at Chalais Meudon in 1884, a prototype which dominated French airship construction for nearly 30 years. It had an enormously long car, constructed of steel tubes which was really a girder designed to overcome the rigging difficulties. Only a small portion in the centre was used for carrying the engine and crew, the rest serving for the support of the twin rudders at the rear. Its envelope, which measured 175 ft. long, with a maximum diameter of 50 ft., containing about 100,000 cub. ft. of hydrogen, ended at the rear in four large pear-shaped protuberances, which were supposed to give directional stability. At the forward end of the car-girder, which was no less than 92½ ft. long, was a triplane elevator. This girder, by the way, it is interesting to record, was made by Robert Esnault-Pelterie, whose name figured so large in contemporary aeroplane development. The engine was a four-cylinder 80-h.p. Rénault.

The example of the Lebaudy school of semi-rigid construction existing at this time was the *Liberté*, the fourth of the type. Like its predecessors, it had a sharply-pointed nose, with a rounded tapering stern, where four dart-like fins were mounted. Along the under side of the envelope was a long keel girder, with the rudder at its rear extremity. The envelope was 190 ft. long, with a maximum diameter of 35½ ft., the volume being 145,000 cub. ft. It was driven by a Panhard engine of 135 h.p.

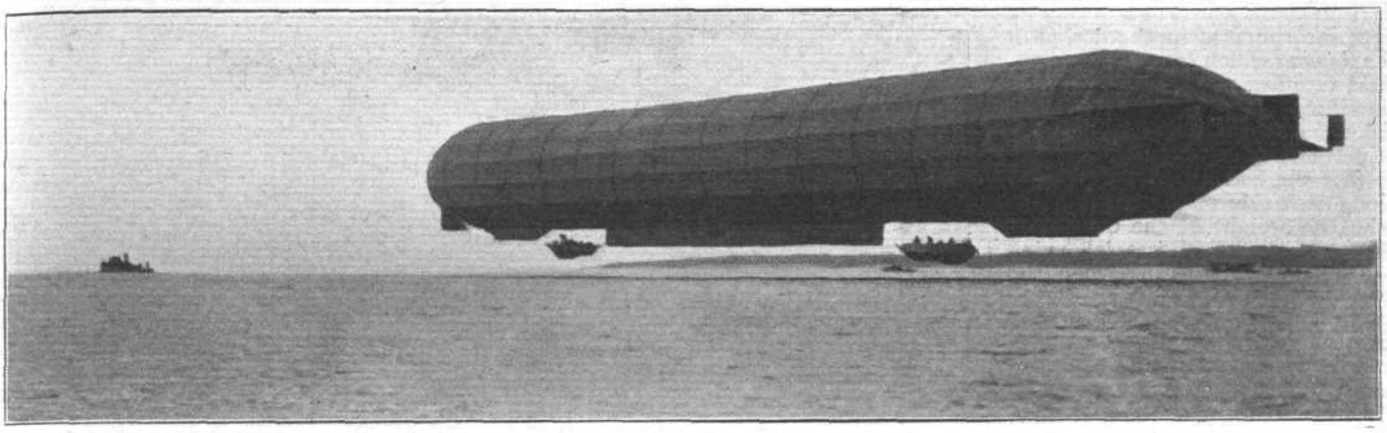
In Germany, two types of airship, apart from the Zeppelin, were being developed. *Gross II*, the second airship designed by Major Gross, of the German army, was frankly on Lebaudy lines, but with a cylindrically-shaped envelope made by the Riedinger firm, in Augsburg. It had a volume of 176,000 cub. ft., and was driven by two 75-h.p. Daimler engines. On September 11, 1908, it made a flight of 176 miles in 13 hours, with a crew of four, which was much the longest airship fligh up to that time. None the less, the type was never really successful, and was soon abandoned, after about four had been built.

The Motorluftschiff Studiengesellschaft, formed a little earlier at the personal instigation of the Kaiser, had taken in hand the development of the non-rigid airship ideas of Major von Parseval, who had been associated with Capt. Sigsfeld in the design of the famous *Drachen* balloon of 1897, and had, at the end of 1908, produced *Parseval II*, which was immediately bought by the German military authorities. The feature of all Parseval airships, right up to the war period, was that they had no elevators, but relied on alternately forcing air into and valving it from the two ballonnets situated fore and aft. *Parseval II* had a cylindrical envelope with a pointed stern measuring 190 ft. long, with a maximum diameter of 31 ft. Its capacity was 135,000 cub. ft., and it was powered by a four-cylinder 100-h.p. Daimler engine driving a propeller with four blades of fabric on a steel tube frame. The short car was suspended 41 ft. below the gas-bag, and could be wound backwards and forwards on rollers on one of the suspension cables, to alter the longitudinal trim of the airship.

England was at the beginning of 1909 without an airship. The *Nulli Secundus*, which had originally appeared in 1907 and been reconstructed in the spring of 1908, had been finally deflated in the autumn, it having been recorded on her last flight, or one of her last flights, that she "went out and came down bump." A new airship was, however, in course of construction, and made its appearance on May 11, 1909, with Colonel Capper as pilot and Mr. Wade as engineer. This was the *Baby*, the first, and smallest, of a long line of small non-rigids of the type which the British Army and Navy made peculiarly their own. She had a gold-beater's skin envelope of only 24,000 cub. ft. capacity with three inflated fins on Clément-Bayard lines at the stern. The car was boat-shaped, with skids underneath for landing, and carried a large balanced rudder and a divided elevator at the rear. An interesting feature was that in spite of her small size she had two three-cylinder Buchet engines, though of only 8 h.p. each.

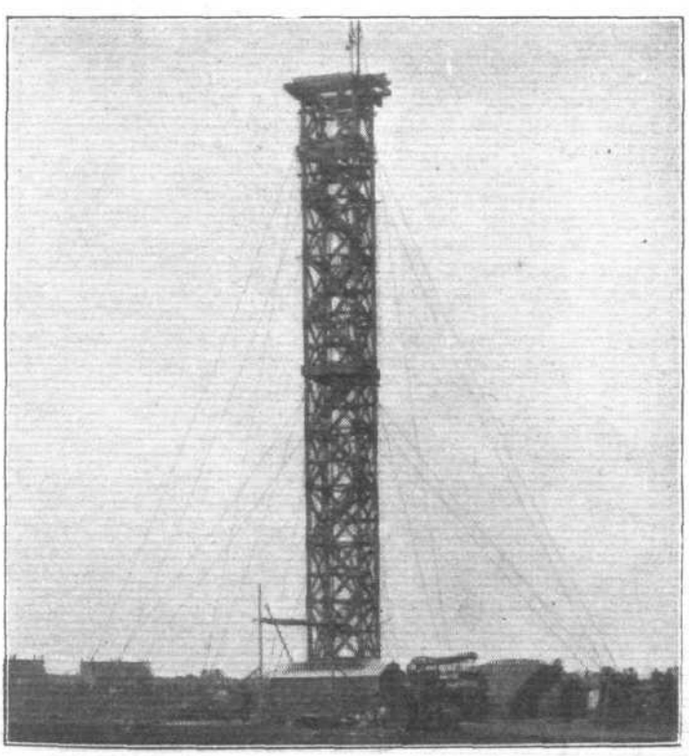
Italy had already began experimenting on individual lines with the semi-rigid types in which, after a short time, she was to become for many years the leading, and only, exponent. Two airships of the "P" class, designed by Captain Ricaldoni, with the advice of Captain Crocco, were in existence. The box-kite type of rudder, with automatic gear to relieve the pilot of much of the work of keeping the ship on her course, invented by Captain Crocco, was already a feature. Otherwise these airships were chiefly notable for the exceptionally good streamline shape of the envelope, which was a very considerable advance on anything seen up to that time, and. indeed, would hardly disgrace a modern airship. It measured 216 ft. in length, with a maximum diameter near the nose of 36 ft., after which it "ran home" in a gradual taper to the sharp pointed stern. These ships were powered with a 70-h.p. Clément-Bayard engine. The volume was about 180,000 cub. ft. Early in 1909 there also appeared the *Leonardo da Vinci*, the first of the semi-rigids with a tubular steel keel designed by Ing. Forlanini, in which wires carrying the weight of the keel were carried up through the interior to the upper surface of the envelope. The compartmented envelope was 130 ft. long, with a maximum diameter of 78 ft., and had a volume of 120,000 cub. ft. It was driven by a 40 h.p. engine.

This rapid survey of the type of airship existing in different countries twenty-one years ago will give some idea of the state of flux in which the science was at that time. In spite of the number of years start that the airship had had over the aeroplane, little real progress had been made, partly, perhaps, because practically all development had been in the hands of Governments, and there had not, therefore, been much opportunity for the exchange of ideas. Even where private firms were involved the same spirit of secrecy prevailed, and, consequently, each type was proceeding on parallel lines by a process of trial and error, so that each was able to learn nothing from the other, and they were all prone to



AT A BARELY SAFE ALTITUDE : An early Zeppelin Airship flying over Lake Constance.
(FLIGHT *Photo.*)

make the same, or similar, initial mistakes. With the knowledge then prevailing it was perhaps inevitable, however, that there should in the main be a family resemblance between most of the airships building in different countries. To the reader of FLIGHT at that period it all seemed rather chaotic and exasperating. Chaotic because of the outward similarity of airships, of which, even from the well-informed columns of the new paper, it was impossible to get any but the most general details, tantalising in their lack of informative data. It was almost too soon (though one has dim recollections of vague impressions, savouring rather of instincts than definitely formulated ideas) to be sure that each country might be tending towards the development of a distinctive type. Looking back now, it is, of course, clear that this was so in a number of cases. Italy, for instance, was definitely already beginning to tend towards the rather clumsy but essentially robust and practical semi-rigid of later years, replete with "labour-saving devices" such as the automatic air-valve in the nose and the semi-automatic rudder control. France was obtaining something of a lead in semi-rigids with the Lebaudy, and in non-rigids with the Clément-Bayard, but French airships showed a curious lack of imagination, and were too dependent on the Rénard tradition, and too prone to rely on cumbrous hemp ropes for rigging in place of the wire ropes that other nations were already beginning to use. It seemed, an impression that was to remain until well on into the war years, that France's invention of the balloon was a positive handicap, because it made her continue to think of an airship as a dirigible balloon, and so stick to clumsy envelope shapes, adapted balloon values, balloon netting for rigging purposes, and in many ways it made her unable to break away from tradition. England was beginning to strike out a line of her own with very small handy airships of a type suitable for use in a small island with only a narrow stretch of water separating her from potential enemies. The comparative success of the *Baby* showed that with due attention paid to lightness of car construction and envelope it was possible to build an airship on a small scale with a performance not despicable compared with the more ambitious productions of other nations.



Short-lived Ambition : A wooden mooring mast was erected at Croydon a few years after the war, but when the airship programme was abandoned the mast was dismantled, having been in existence for a few weeks only. (FLIGHT *Photo.*)

Germany was toying with what was in essentials a copy of the French Lebaudy semi-rigid, but was already well on the way with developing the Parseval, which, though at this time only in embryo, was later to set an example in streamlining that was to be a subject of admiration and imitation until, at any rate, the later British S.S. types were produced about 1917. It is impossible within the limitations of a short article to do more than sketch the progress that has been made in non-rigid airships, and it is, in fact, true to say that until 1915 very little advance in design took place, or, at all events, that the strides that were made during those three years quite put into the shade all that had been done before. It is at the same time no exaggeration, and it is not merely national pride, to state that this development was entirely due to the efforts of the Royal Naval Air Service, which made of the non-rigid airship quite a new thing, and completely outstripped the airship designers of other countries. All who were Allies, and so were in a position to do so, bought examples from us. Except, then, for a short account of Parseval development up to the war, when this type almost at once became overshadowed by the Zeppelins and very soon dropped out of production, the story of the non-rigid airship development as written here will be confined entirely to Great Britain. In the same way the rigid airship story must of necessity be almost as exclusively confined to the evolution of the Zeppelin.

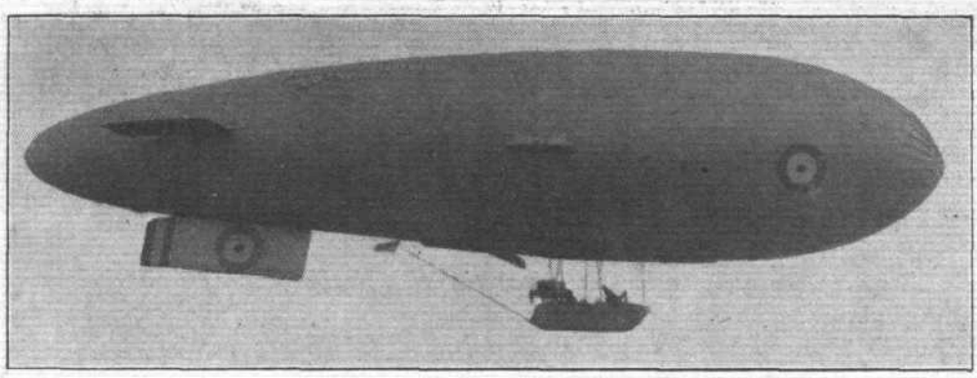
It is impossible to treat the two contemporaneously, and therefore it is proposed to take the non-rigid first, going back to give an account of rigid development later.

Though the *Baby* was to some extent successful, it was soon decided that she was not enough practical use, and therefore in the autumn of 1909 she was deflated for alteration, after an R.E.P., and a 35-h.p. Green engine had successively been installed. This took the principal form of adding a section in the envelope. Meanwhile No. 2, the *Gamma*, had been put in hand and made its appearance on February 7, 1910. The envelope was 152 ft., long, with a maximum diameter of 30 ft., and 80,000 cub. ft. volume. *Gamma* was a non-rigid with a car in the 85 ft. long keel. She was the first airship to be fitted with swivelling propellers, an aid to landing much believed in by the British Army Airship authorities.

In May of the same year *Baby* reappeared as *Beta* with her envelope enlarged to a capacity of 35,000 cub. ft. and the car, still with the 35-h.p. Green engine, lengthened proportionately.

The next British Army airship, the *Delta*, was a revulsion against the long girder-car of the French school that had

been incorporated in the design of the *Gamma* which made her a semi-rigid in effect though not in strict classification. *Delta* was at first rigged as a true semi-rigid, though in place of a keel along the under surface she had a flat girder laced along each side of the envelope to take the weight of the car. But this not proving successful owing to the girders buckling when the load was applied, she was re-rigged as a non-rigid when she proved remarkably fast for her time, with a maximum speed of 44 miles an hour. She had a capacity of 173,000 cub. ft. For the first time, use was made on her envelope early in 1913 of a flexible varnish, known as "Delta Dope" which went far to solve the problem of envelope leakage. This airship, it may be remembered, was exhibited at the Olympia Aero show in the spring of 1913 where the swivelling propeller system aroused much interest.



A successful type of British non-rigid airship: The S.S. "Zero" of 1917 or so. (FLIGHT *Photo.*)

Delta was followed towards the end of 1913 by *Eta*, a 118,000-cub. ft. ship, with two 80-h.p. Canton-Unné engines again driving swivelling propellers. On her was used an entirely new system of rigging of great importance since, perhaps almost more than anything else, it was this that made possible the success of future British non-rigids. The problem of rigging the cars of non-rigid airships so as to distribute the load tolerably equally over the envelope without bringing tension on the under surface had always presented great difficulties, the semi-rigid keel and long car-girder being two of the numerous solutions that had been tried. Originally, of course, a balloon-net had been used over the upper surface, but later an attempt to get away from the extreme weight of this had been tried by introducing a "rigging band" stuck and sewn round the envelope longitudinally at about the "equator." This still involved an unreasonable amount of weight. The solution evolved at the Royal Aircraft Factory at Farnborough where the Army airships were built lay in the invention of what was named the "Eta patch." This consisted of a "D" shaped piece of metal laid on its side with the suspension cable attached to the bar. Through the semi-circular portion were passed strips of webbing which were stuck and sewn in a fan pattern to a piece of fabric, thus completing the patch. Each suspension cable ended in a number of "bridles," each with its own "Eta patch." Consequently these could be put exactly where desired on the envelope and the distribution of the load was very much better located than had been possible before.

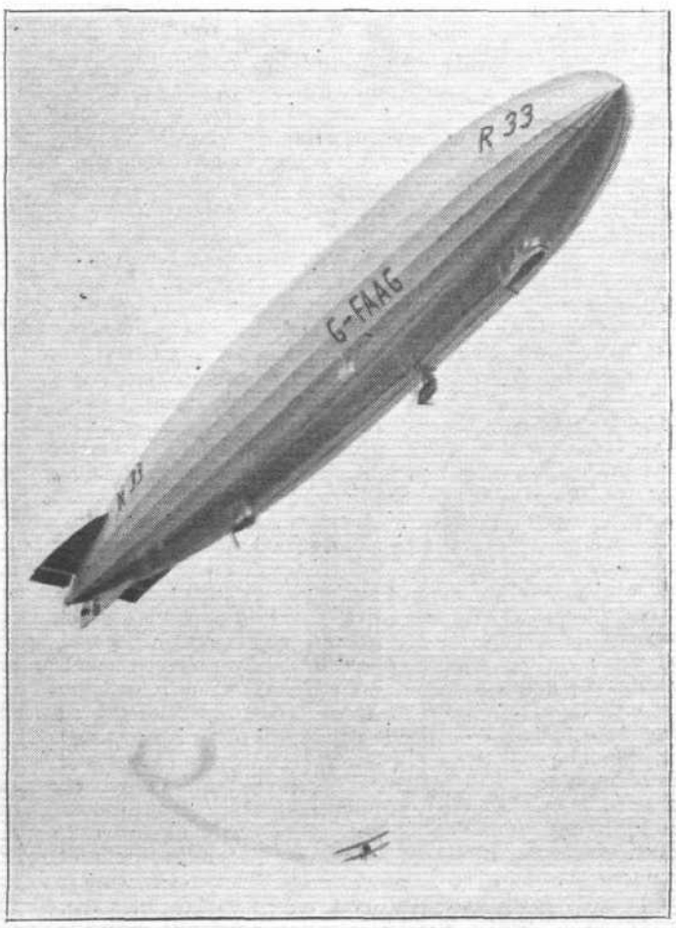
Towards the end of 1913 the long series of experiments in moving out airships in the open, which have ultimately been brought to such a successful issue, were started. The envelope of *Gamma*, with a temporary girder rigged below, was first used; then *Delta* was experimented with, and, later still, a French built *Astra Torrés* was used for the experiments. The original device consisted of a lattice-steel mast with a revolving cone mounted on its side at the top, into which the nose of the airship could be drawn.

This brings the story of British Army non-rigids down to the beginning of 1914, when No. 1 (Airship) Squadron, R.F.C., was disbanded and the airships and crew were transferred to the Naval Airship Service. Meanwhile the Navy, except for one experiment in rigid airships, with No. 1, built by Messrs. Vickers at Barrow-in-Furness, had been depending on experiments with airships bought outside. Rigid Airship No. 1 was frankly built as far as possible on Zeppelin lines. She was originally launched on May 22, 1911, when she was warped out to the centre of the Cavendish Dock where she was moored out on the water to a mast fitted with an open-work rope screen to break the force of the wind. She remained at the mast till May 25, no attempt at flight being made. Owing to her lack of lift she was then taken back into the shed and various modifications made to lighten her. These included the removal of the structural keel, which so weakened the hull that when she was being warped out to the mast again on September 22, 1911, the framework collapsed. This accident, though the ship was undoubtedly weak, was directly due to a mistake in handling, one of the parties on a hawser continuing to haul in without noticing that the after car had fouled a buoy.

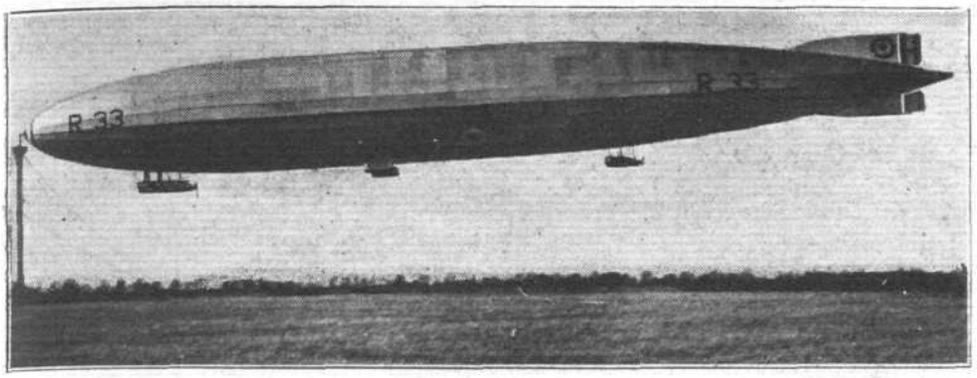
The first non-rigid known as No. 2, bought by the Navy, was a small airship, built by Mr. G. T. Willows, the fourth airship he had constructed. Mr. Willows had produced his first airship in 1905, at Cardiff. It had a volume of only 12,000 cub. ft., the silk envelope being 74 ft. long and 18 ft. in diameter. It was driven by a 9-h.p. Peugeot motor-cycle engine. It had neither rudder nor elevator, relying for steering, in both senses, on twin propellers fixed on the front of the car, and capable of being swivelled from side to side and up and down.

Willows II was built at Cardiff, in 1909, and embodied the feature which also characterised his subsequent airships. This was a long boom slung below the envelope, with the car suspended at the centre. *Willows II* had a capacity of 20,000 cub. ft., and flew from Cardiff to the Crystal Palace on August 6, 1910. It had a 35-h.p. J.A.P. engine driving swivelling propellers.

Willows III, christened the *City of Cardiff*, had the same J.A.P. engine, and in her, on November 4, 1910, Mr. Willows succeeded in crossing the Channel and reaching Paris. She had a volume of 33,000 cub. ft., the envelope measuring 110 ft. long, with a maximum diameter of 24 ft. *Willows IV*, which measured 90 ft. long, with a maximum diameter of 20 ft., giving a capacity of 20,000 cub. ft., appeared in May, 1912. She had the same boom terminating in a rudder,



The flying aerodrome: The rigid British airship R.33 carrying out experiments with dropping aeroplanes while in the air.
[FLIGHT *Photo.*



A successful early mooring mast: R.33 riding at the mast at Pulham. (FLIGHT *Photo.*)

the elevators being on the envelope. She had a 35-h.p. "Y" Anzani engine, driving swivelling propellers above the small well-streamlined car. *Willows IV* was bought by the Navy in November, 1912, the boom being immediately done away with, and a new car made.

Naval Airship No. 3 was of an interesting type, built by the Astra firm in France, to the designs of Senor Torrés-Quevedo, a Spanish engineer. The distinctive feature of these Astra-Torrés airships was the internal rigging system. The main car suspensions were led through sleeves in the bottom of the envelope into the interior, where they branched and were carried up to an internal fabric top-ridge on each side. This resulted in the load of the car being borne entirely by the top surface of the envelope, where any end pull served only to put the fabric in tension, which it was able to resist. The result of this system was that in cross-section the envelope was trilobe, or clover-leaf shaped. No. 3 airship was used a good deal at the beginning of the war, and proved most successful, though another ship of the same type, No. 8, was rather less so. They were the forerunners of the successful series of British-designed classes, "Coastal," "Coastal Star," and "North Sea," that were largely used for anti-submarine work from 1916 onwards. No. 3 had a volume of 230,000 cub. ft., and was driven by two 210-h.p. Chenu engines at a speed of 51 miles an hour.

Naval airship No. 4 was a Parseval, bought from Germany, also in 1913. This airship, as has already been stated, was characterised by the extraordinarily fine streamline shape of the envelope, which was interesting in other ways. In the first place, it was three-ply, very strong, with exceptional gas-holding properties. It also incorporated a system of rigging which had many advantages. Forming an ellipse along the under surface was a rigging band, from which ran a number of fabric bands, known as "trajectory bands," right over the top surface and down the other side. These bands were nearly vertical at the centre, but sloped progressively more and more towards the nose and, in particular, the tail, so that the weight of the car was well distributed—as in the Astra-Torrés, but by a different system—along the whole top surface of the ship. As a result of this, the car was able to be slung unusually close to the envelope. She had two 170-h.p. Maybach engines and, besides doing valuable service in the early stages of the war, proved a most excellent training ship. To have been captain of No. 4, indeed set a seal on an airship pilot's reputation, and qualified him automatically for command of a rigid airship as soon as one became available.

This, except for the fact that rigid airship No. 9 was under construction, was the position when war broke out in August, 1914. The story of the war development of British non-rigid airships is too well known to need much elaboration here. Not much in the way of development took place, though a good deal of flying was done with existing ships, until March, 1915, when S.S. 1 was evolved from the envelope of No. 2 (*Willows IV*), and the fuselage of a B.E. 2 aeroplane. Messrs. Airships, Ltd., built an experimental airship to the same specification, but it did not find favour with the authorities, and no more were ordered, though the firm built a number of Maurice-Farman aeroplane-type cars for use under S.S. envelopes. Messrs. Armstrongs also tendered, with an airship with an A.W. aeroplane fuselage, which proved successful, and a number were built and put into service. All the S.S. airships had 60,000 or 70,000 cub. ft. envelopes, and were fitted with either Rolls-Royce or Rénault engines. In 1916, the S.S.P. ("Pusher") type was designed, at Kingsnorth, with a more comfortable car, fitted with a 100-h.p. Green engine at the back. The most noticeable novelty of all the S.S. type, which was also incorporated in the larger non-rigids, was the hinged blower-pipe, taking air from the slip-stream of the propeller to the ballonnets, a device which entirely did away with the necessity for carrying an auxiliary engine to drive a blower. Early in 1917, all other S.S.'s were superseded by the S.S. *Zero*, designed by the personnel of Capel Airship Station. This type had a most comfortable water-tight car, seating three in tandem, with a Rolls-Royce 75-h.p. engine, mounted on a gantry at the back. The first ship was an immediate success, and the type was standardized, something like a hundred being put into service before the Armistice. At the end of the war, experiments were being carried out with several types of "S.S. Twin," with two engines. The most interesting of these was, perhaps, "S.S.E.3," which had an envelope known in the laboratory as shape "U. 721," from which the hull shapes of both R 100 and R 101 are derived.

From 1916 onwards, much was done to develop larger ships on Astra Torrés lines. The first was the "Coastal" class which had an Astra-Torrés envelope with two Avro fuselages cut in half and joined end to end, to provide a tractor and pusher propeller, as car. These were gradually superseded by the rather larger "C Star" class which had a streamlined envelope and improved car, though on similar lines. They had 210,000 cub. ft. envelopes, compared with the 170,000 cub. ft. of the Coastals, and were as a rule fitted with a 100 h.p. Berliet engine forward and 260-h.p. Fiat aft. Concurrently with the "C Star," the "North Sea" type was developed with a 360,000 cub. ft. envelope of improved streamline shape and a greatly improved enclosed car in which the crew could move about, and were indeed most comfortable. They had 240-h.p. Fiat engines, and one of them soon after the Armistice made a duration flight lasting for 101 hours. Both the "Coastals" and "North Sea" types, though founded on the *Astra Torrés*, were a great improvement in detail on their prototype. The clumsy bunches of rope used for the internal rigging were, for instance, superseded by wire cables.

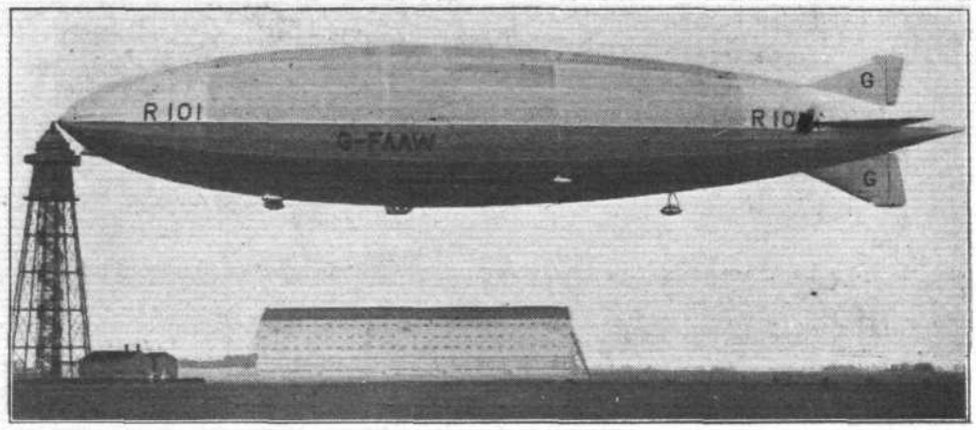
To return to the rigid airships of Count Zeppelin, *L.Z.I* was built in 1900. The hull was of cylindrical shape with hemispherical ends and incorporated the structural form, which has been adhered to ever since, of a number of longitudinal girders connected at intervals with a series of transverse frames forming bays within which the gas-bags are enclosed. The transverse frames are braced by radial wires carried to a ring in the centre of the circumference. *Z.I* had two cars, each containing a 16-h.p. Daimler engine, connected by a long steel boom on which ran, operated by pulleys, two trolley cars for altering the longitudinal trim. It measured 420 ft. long with a diameter of 38 ft. There were 24 longitudinals and 16 transverse frames enclosing 16 gas-bags. This first airship made three flights and though considerable success was achieved it was five years before Zeppelin could collect sufficient funds to build a second airship. On her second flight *L.Z.II*, which had two 85-h.p. engines, was forced to land, through engine trouble, and had to be moored out in a field. Unfortunately the wind got up and the ship was so badly damaged that she had to be dismantled. In the following April, 1906, *L.Z.III* was started, and she was completed by October of the same year. She was improved by the addition of stabilising fins on the envelope and had four propellers carried on outriggers on the hull and driven through shafting, a system of propulsion which was adhered to for many years—until the appearance of the *L.*40 class in 1916.

It is impossible to detail all the different Zeppelins that were built and the most one can do is to pick out one or two of the most prominent as instances of the general trend of development. The first passenger airship was the *Deutschland* built in 1910 followed by the *Schwaben* (1911), the *Viktoria Luisa* and *Hansa* (1912). The *Schwaben* was 460 ft. long, with a diameter of 46 ft. and a volume of 620,000 cub. ft. She had three 145-h.p. Maybach engines. The *Viktoria Luisa* and the *Hansa* were sister ships measuring 485 ft. long and 46 ft. in diameter with a capacity of 670,000 cub. ft. In 1913 the *Sachsen* was added to the "Delag" fleet. She was the same length as the *Schwaben*, but had a diameter of 50 ft. which increased the capacity to about the same as the

Hansa. Her speed was nearly 50 miles an hour and she carried 24 passengers. In all these airships there was an external keel which was broadened at the centre to form the passenger saloon and carried an engine car suspended from it at each end with shaft drive to propellers on the hull. This series of pre-war commercial Zeppelins has never been sufficiently appreciated, nor has their striking record of passenger-carrying, without a single accident, ever received adequate recognition. Among them they made 1,588 flights of 2 hours' duration, averaging 68 miles each with 22 passengers. The flights represented an aggregate of 3,167 hours in the air, covering nearly 175,000 miles, during which a total of 3,400 passengers was carried. The first attempt at "mass production," was the *L*.3 class, comprising *L*.3 4, 5, 6 and 7, which were built for the Navy in 1914. They had transverse frames of uniform size to facilitate production so that they were parallel-sided except for the ends. They had a capacity of 788,000 cub. ft., and had a speed of about 45 miles an hour, with a ceiling of about 10,000 ft. These were followed by the *L*.10 class, about 20 of which were built, 10 for the Army and 10 (*L*.10-19) for the Navy. With a volume of 1,130,000 cub. ft. they were the first to exceed 1,000,000 cub. ft. They were slightly more stumpy with a fineness ratio of 9 to 1 instead of 11 to 1, and had a tapering stem which resulted in an increase of speed up to about 55 miles an hour. They had a disposable lift of 37 per cent. of the gross lift. Early in 1916 the *L*.20 class (of which eight in all were built) was produced with a volume of approximately 1¼ million cub. ft.

Increase in the performance of anti-aircraft defences and of aeroplanes led to the design of the *L*.30 class which, largely probably owing to Schütte-Lanz influence, were a great advance on their predecessors and were commonly known as the "Super-Zeppelins." The external keel had by now been abandoned and an internal "A" keel, which has remained ever since, in which the petrol and water ballast tanks were hung, and which incorporated a walking-way along the bottom of the ship, was introduced. The *L*.30 class had six engines in four cars—one behind the control car, two wing cars, and three engines in an after car, of which one had a direct-drive propeller, and the other two operated the shaft-driven propellers in the hull. This class, though retaining a considerable length of parallel portion, had a much better streamlined hull, and the performance was a great advance on preceding ships.

The first ship had a disposable lift of 45 per cent. of the gross lift. In later ships this was increased to 50 per cent. What was surprising was that the designers still adhered to the archaic method of having shaft-driven propellers on the hull, which one would have thought was obviously inefficient, and also involved a fruitful source of trouble in the long shafting. This was not discarded until the appearance of the *L*.40 class in 1917, which developed a speed of some 70 miles an hour. With the exception of the special long-distance *L*.59, which made the famous trip from Bulgaria nearly to German East Africa, not much further development took place until the *L*.70 class was introduced just at the time of the Armistice. In the pursuit of lightness the transverse frames were spaced much farther apart (15 m. instead of 10 m.) in these ships, of which only two were built. This was not a success, as excessive vibration developed in the longitudinals, which had to be cured by intermediate stirrup wires led down from the upper surface through the gas-bags to the keel. The British airship, R 38, copied these features of long bays, but, unfortunately, did not have the stirrup wires and so failed.



The Latest: This picture affords an interesting comparison not only between R.101 and R.33 but also between the mooring masts at Pulham and at Cardington. (FLIGHT *Photo.*)

After the Armistice the Zeppelin Company produced two very efficient passenger ships, the *Bodensee* and *Nordstern*, which had a fineness ratio of 6·5 to 1, and developed a speed of 84 miles an hour. They were, however, considered to contravene the terms of the Peace Treaty, and were confiscated by the Allies.

Before this the *Bodensee* made 103 passenger trips in 98 days at an average speed made good over the ground of 62·4 miles an hour. The disposable lift was about 60 per cent. of the gross lift—a remarkably fine performance in a ship of only 800,000 cub. ft. capacity.

Post-war Zeppelins such as the *Los Angeles* and *Graf Zeppelin* seem rather to show that the design has settled down into a groove on traditional lines, and both the British airships, R 100 and R 101 are advances on them. R 100 is primarily on Zeppelin lines, but has no intermediate longitudinal or transverse frames, and is of lighter, though probably actually stronger, construction. Streamlining, as in R 101, has been developed to almost its extreme limit, while the internal keel has been done away with altogether, and the hull framework made self-sufficing. R 101 is still more of a departure from tradition, owing almost nothing to Zeppelin influence. The transverse rings are of deep (10 ft. 6 in.) section, and entirely self-supporting without the radial wiring that is still retained in R 100. Another important novelty in R 101 is the entirely new type of gas-valve, which has been designed to deal with the escape of gas resulting from an estimated possible rate of rise of 4,000 ft. per minute. This is an example of the good that may come from lamentable failure, for it was the accident to the *Shenandoah* in America, which collapsed through being carried up in a line squall at a rate of rise with which her valves were unable to cope, that led the designer of R 101 to consider this problem entirely anew.

In such a short sketch as this it has been quite impossible to indicate in anything but the most general way the lines on which airship development has proceeded in the last twenty-one years. Let us hope that by the time FLIGHT achieves its twenty-fifth birthday the airship will have rehabilitated its reputation, lost since the tragic disasters to R 38 and the *Shenandoah*, and have begun to establish itself as the most delightful vehicle of travel, which it is admitted to be by all who have been lucky enough to have experience.

THE NEW C.A.S.

Sir John Salmond's Career

IT can seldom have happened that a fighting service has owed so much to one family as the Royal Air Force owes to the brothers Salmond. Geoffrey and John are the sons of Major-General Sir William Salmond, K.C.B., Colonel Commandant of the Corps of Royal Engineers. Geoffrey was born in 1878 and John in 1881. The brothers were educated at Wellington College, from which Geoffrey went to Woolwich and entered the Artillery. John went to Sandhurst and became a subaltern in the King's Own

The New Chief of the Air Staff—Air Chief Marshal Sir J. M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C.

Royal Lancaster Regiment in 1901. The younger brother served with his regiment in the South African war and received the Queen's medal with three clasps.

In 1912 John Salmond learnt to fly and received certificate No. 272 from the Royal Aero Club. Next year his brother followed his example and received certificate No. 421. When the great war broke out, Major W. G. T. Salmond was General Staff Officer, 2nd grade, in charge of operations on the staff of Brigadier-General Henderson, who commanded the R.F.C. Major J. M. Salmond commanded No. 3 Squadron. It was the first time that the Royal Flying Corps had gone to war, and the other arms were not accustomed to rely upon its reports of enemy movements, and at first showed a disposition to distrust them. It was however, a pilot of No. 3 Squadron, Capt. Charlton, D.S.O., who brought the first news of von Kluck's attempt to turn the British left flank. This news saved the Allied armies and prevented the Germans from winning a decisive victory in the first month of the war.

The battle of Neuve Chapelle on March 10, 1915, opened with bombing attacks by the R.F.C. on important points behind the German lines. Three aeroplanes of No. 3 Squadron attacked a divisional H.Q. in Fournes at 6 a.m. The bombs in those days were dropped by hand. Major J. M. Salmond occupied the observer's seat in one of these machines, and three times the pilot, Capt. Conran, dived to within 100 ft. over the building before his squadron-commander would drop his bombs. On the third day of the battle, a bomb-laden Morane caught fire on the aerodrome of No. 3 Squadron, and when the flames had died down it was found that all the bombs had not exploded. Twelve men had already been killed by the bombs which had gone off, and Major Salmond forbade anyone to go near the wreckage that evening. He himself got up at daybreak next day and removed and buried the remaining live bombs.

At this time Major Salmond interested himself keenly in the earliest attempts at air photography and observation for the artillery. The subsequent remarkable development of these two arts was largely due to his initiative in 1915.

Later on, Major Salmond commanded No. 7 Squadron, but promotion came to him rapidly. At the battle of Loos in September, 1915, he commanded the 2nd Wing of the R.F.C., consisting of Nos. 1, 5, 6, and 7 Squadrons. This command naturally brought with it the rank of Lieut.-Colonel. By February, 1916, he had become Brigadier-General and commanded the 2nd Brigade, R.F.C., which comprised the 2nd and 11th Wings. Then he was ordered home to reorganize flying training in Great Britain, and handed over his command to Col. T. I. Webb-Bowen.

In December, 1917, General Trenchard relinquished command of the R.F.C. in France on being appointed Chief of the Air Staff. He was inevitably succeeded in France by Major-General J. M. Salmond. The latter continued to hold this command until the Armistice. During that period the R.F.C. (Military Wing) and the R.N.A.S. were amalgamated into the Royal Air Force.

Since the Armistice, Sir John Salmond has commanded the Inland Area, he has been A.O.C. in Iraq, and he has been Commander-in-Chief of the Air Defences of Great Britain. He has visited Australia to advise on the re-organisation of the Royal Australian Air Force. A year ago he became Member for Personnel on the Air Council.

In 1913 Sir John Salmond married Miss H. A. Lumsden, who died in 1916, leaving one daughter. In 1923 he married the Hon. Monica Margaret Grenfell, daughter of the first Baron Desborough.

Now Sir John Salmond succeeds Sir Hugh Trenchard once more, this time as Chief of the Air Staff. It is the highest appointment in the Royal Air Force, and is, indeed, almost the only post of first-class importance in the service which Sir John has not already filled.

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VALE

Dedicated to Sqdn.-Ldr. Jones-Williams and Flight-Lieut. Jenkins, who lost their lives when their monoplane crashed near Tunis, on December 18, 1929. They were endeavouring to make a non-stop, long distance flight to the Cape of Good Hope

You knew the rush of wind beneath your feet,
The power of wings, the thrilling joy of flight,
Your hearts throbbed with the engine beat for beat,
Through each glad day, and swift, mysterious night.

You crashed to death beneath a storm-swept sky,
The great wings crumpled, and the engine's scream
Faded to silence. No one saw you die,
Two lonely airmen with their broken dream.

Jon Simon.

AIRISMS FROM THE FOUR WINDS

Mr. Chichester's Flight to Australia

MR. CHICHESTER had a slight mishap when he landed near Tripoli on December 21.

The trouble, however, was not due to engine trouble as reported last week. He had arranged for the aerodrome to be lighted at Tripoli, but when he arrived there, nothing had been done, so he landed on the sand dunes and in doing so broke his airscrew. A new one has been sent out and he should be proceeding shortly.

The report which said he was unmarried was also very regrettably untrue, but a tragic sequel is the news that his wife died in New Zealand about the same time as he left Croydon.

The French Flights to Saigon

A MESSAGE from Tunis states that the bodies of MM. Lassale, Rebard and Faltot, who have been missing since December 15, have been found beside the wreckage of their machine near Sirte, on the coast of Cyrenaica. Death was apparently instantaneous. The three airmen were attempting a flight from Paris to Saigon (Indo-China), and had left Tunis for Benghazi on the morning of the 15th.

The French Air Ministry has received a telegram from M. Le Brix, the French airman who, with M. Rossi, set out on December 16 last on a flight from Paris to Saigon (Indo-China), stating that he and his companion were forced to take to their parachutes while flying near Moulmein, Burma, on December 23. M. Rossi was slightly hurt, but M. Le Brix was uninjured. The machine was destroyed.

The Search for Lieut. Eielson

SEMYON SHESTAKOV, the Russian pilot who recently flew from Moscow to New York, has been selected by the Soviet Government to head the expedition of three Soviet aeroplanes in the search for Lieut. Eielson and Mr. Borland, his mechanic, who have been missing in the neighbourhood of North Cape, Siberia, since November 9.

Exploration in the Antarctic

CAPTAIN RIISER LARSEN, of the Royal Norwegian Navy, who is leading the Norwegian exploration and research expedition in Antarctic regions on board the ship *Norvegia*, which has been equipped by Mr. Lars Christensen, of Sandefjord, reports by wireless that he, with Captain Luctzow Holm, also of the Royal Norwegian Navy, has discovered new land between Kemp Land and Enderby Land, in the King Haakon VII Sea, and has taken possession of it in the name of the King of Norway in accordance with the provisions of international law.

Captain Larsen reports that he and his companion left the *Norvegia* in one of the two seaplanes carried by the ship and alighted on an open stretch of water close to the shore. They then proceeded ashore on skis and hoisted the Norwegian flag. Later they flew back to the *Norvegia*, which was then about 100 nautical miles off shore.

Sir Hubert Wilkins, head of the expedition financed by Mr. Hearst, in a wireless message to New York from the steamer *William Scoresby*, indicates that by December 26 he will have established a base near Alexander Island, from which with a seaplane he will make another raid into the unknown Antarctic.

Commander Byrd will be leaving shortly for America, and it is anticipated that the maps he has made, together with Sir Hubert Wilkins's discoveries, will provide geographical knowledge of the farthest South, hitherto only speculative or absent.

Wilkins reports that he and his men, despite the low temperatures, are being tanned by the Antarctic sun as if they were in the tropics.

Midshipmen's Air Course

A REMINDER is given in current Fleet Orders that every effort is to be made to ensure that all midshipmen undergo the junior officers' air course while holding that rank. The names of those who are unable to do so are to be specially reported to the Admiralty on discharge to shore courses, in order that arrangements may be made for them to undergo the course after appointment as sub-lieutenant.

Death of Dr. Maybach

DR. WILHELM MAYBACH died at Stuttgart on December 29. He was 84 years of age. After he retired from the direction of the Daimler works in 1907, his son, Dr. Karl Maybach, produced the first of his airship engines and subsequently founded the Maybach Motorenbau G.m.b.H., at Friedrichshaven. This success fired the old man so much that he came out of retirement to join his son and devoted himself to organisation and management, while his son managed the technical side of the factory.

R 101

A VERY bold decision has been made with regard to the modifications of the airship R 101. This amounts to nothing less than inserting a new bay, consisting of transverse ring, lengths of longitudinals and a gas bag of 500,000 cub. ft. capacity. This decision was announced by the Under Secretary for Air in Parliament on December 18. A similar operation was carried out on the German commercial airship *Bodensee*, and on other Zeppelins. In those cases the insertion of the new bag affected either the factors of safety or, in the case of the *Bodensee*, the fineness ratio of the ship. In the case of R 101, it is calculated that neither the strength nor the streamline qualities will be appreciably affected, while the commercial qualities of the ship will be substantially improved. It is reckoned that the gross lift of the additional gas bag will be about 15·5 tons, while the additional structure will weigh about 5 tons. The new bay will probably be placed between the eighth and ninth bays aft of the passenger coach.

At the same time the capacity of the existing gasbags will be increased, as it has been found that the clearance between the bags and the frame was unnecessarily generous. This will give an additional 130,000 cub. ft. of gas which will increase the lift by about 4 tons. Several minor modifications are also being carried out, such as the removal of the servo motor for operating the control surfaces, as it has been found that the coxswains can easily move these by hand.

It is presumably not feasible to rebuild the passenger coach, but if that were done, it might be possible to save another ton on the weight of the flooring, without taking any risks with its strength. However, the modifications, which are not difficult and will not be very costly, should increase the lift by over 11 tons. The length will be increased to about 780 ft. The modifications should be complete in about three months.

R 101 has given ample proof of her strength. Hitherto her weak point has been useful load. She should now be able to make a respectable showing in that direction also; though still she will chiefly point the way to the production of a true commercial airship rather than fill that position herself.

New Self-starter for Aeroplanes

PATENTS for a new type of self-starter for aeroplane engines have been taken out in America. The starter has been designed primarily for the bigger radial engines. It consists of an attachment which is screwed into the sparking plug hole of one of the cylinders. The sparking plug finds a place in the attachment, and fires in a normal way after the engine has started.

The attachment consists of a specially constructed "breech," and into this is inserted a cartridge of the shotgun type. The cartridge is fired by a trigger, the charge forcing the piston to the bottom of its stroke, and the engine picks up normally on the other cylinders. The attached "breech" does not affect the engine in any way and weighs about 4 lbs.

Forestry by Aircraft

A GREAT stretch of forest in British Columbia, infested with the hemlock looper pest, has been sprayed from above with calcium arsenate and lime. Results have been so gratifying that plans are being made to extend the process next summer. The hemlock looper has invaded the great Douglas fir belt, and forestry experts have become alarmed at the possibility of destruction of timber trees that are becoming more valuable with the years. A decade ago little could have been done to combat this pest.

Helicogyre Nearly Ready

THE Isacco Helicogyre, which is being built by Saunders-Roe, Ltd., is said to be nearly ready and will probably be tested out at Farnborough.

A Flight to India

MAN MOHAN SINGH, an Indian student at Bristol University, will on Saturday, January 4, set out alone from Stag Lane aerodrome in an attempt to win a £500 prize offered by the Aga Khan to the first Indian to fly from this country to India during 1930. It is highly probable that a young Indian friend of his, Mr. Gadgi, will start at the same time.

The High Speed Record

A REPORT says that an Italian attempt on the speed record will be made over Lake Garda as soon as the weather in the New Year permits.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

INTERNATIONAL COMPARISONS

[2255] In his letter No. 2244, of December 20, Mr. C. C. Walker has taken up the cudgels in defence of the British aircraft manufacturer.

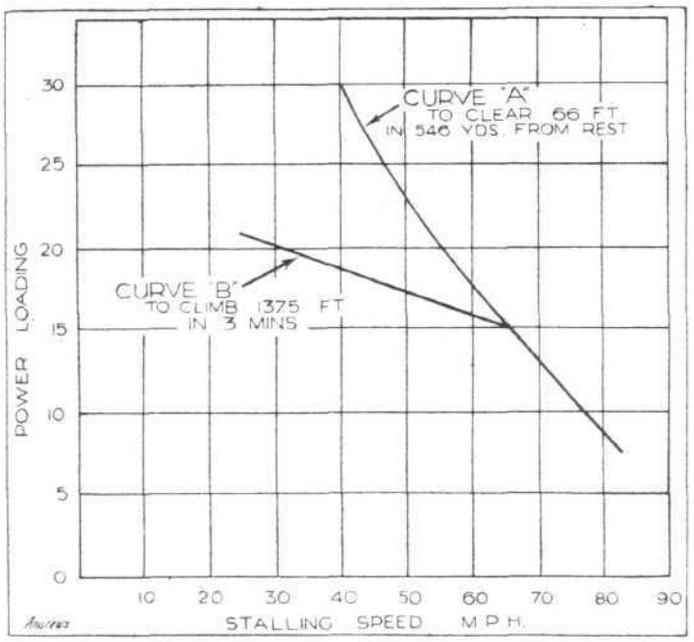
Unfortunately, the method he adopts acts like a two-edged sword, and shows some perfectly worthy British aircraft as not being eligible for a Certificate of Airworthiness.

The graph given in the letter purports to indicate whether or not an aircraft will satisfy certain take-off and climb conditions.

The variables are the wing and power loading; for the purpose of generalising, airscrew efficiency, aspect ratio and parasite drag coefficient are presumably taken as constants for constant values of wing and power loading.

The stalling speed is one very important factor in both the run to take-off and the rate of climb. Mr. Walker has assumed this to be only a wing-loading function. The curve he gives, therefore, is only valid for one particular value of maximum lift coefficient.

A change of maximum lift coefficient from 0·73 to 0·52 involves an increase of 18 per cent. in the stalling speed, for the same wing loading. Thus the optimum climbing speed



for the high lift wing will be about the stalling speed for the low lift wing.

The climb of the high-lift wing (other things equal) will therefore be greater than that for the low lift wing, but Mr. Walker's graph does not take this into consideration.

From the cases I have investigated, it appears that the curves refer to machines having a maximum lift coefficient of 0·52 (approximately R.A.F. 15).

I have replotted the curve against stalling speed in m.p.h. instead of wing loading basis on this assumption. This should give more satisfactory comparisons than the earlier graph.

Below a stalling speed of 65 m.p.h. curve B is the criterion of performance, and not curve A.

At the present moment stalling speeds much over 60 m.p.h. do not seem to be popular, so can be ruled out of the question, and curve B only need occupy our attention.

A simple formula I use to find the approximate maximum power loading to satisfy the climb requirements is

$$\frac{W}{P} \not> \frac{2220}{80 + V_s}$$

W = All up weight, lbs.
P = Normal b.h.p.
V_s = Stalling speed, m.p.h.

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This seems to be similar to curve B.

As pointed out by Mr. Walker, there will be many exceptions to curve B, although the variation should not be more than ± 5 per cent. for machines, which will just satisfy requirements (on a stalling speed basis).

This will probably modify Mr. Walker's remarks about the foreign aircraft "P," which, if of Continental design, is probably a high-lift monoplane.

W. R. ANDREWS.

Technical Department,
A. V. Roe and Co., Ltd.
December 23, 1929.

ACCELERATION

[2256] Originally Mr. Russell said that an acceleration produces a force, now he says that the lift produces the acceleration of the aeroplane; surely both statements cannot be true. May I suggest that the sound way of looking at it is this, that it is the force being transmitted to the various masses via the structure that produces the stresses in the structure; just as it seems unsound to say that the acceleration of a train causes loads in all the couplings—when the couplings are transmitting the engine pull.

Now about St. Paul's: acceleration is rate of change of velocity, so if a body has no velocity and continues to have no velocity it can have no acceleration. Certainly there are two *forces* acting on St. Paul's, but what the force of gravity produces is the reaction, not an acceleration. Likewise there were two *forces* acting on Mr. Russell's lift—but what I queried was his statement that it had two *accelerations*. The pince-nez, too, produced two equal and opposite forces in a horizontal plane and therefore no velocity and no acceleration; *for there can be velocity without acceleration but no acceleration without velocity*.

No matter how many forces act on a body it can only move along one path and have one acceleration. It could only have two accelerations if it could travel along two paths simultaneously, which is absurd—though I admit that a lift that could be at different floors simultaneously might be useful. However, this is a question of physics, not metaphysics, and I cannot credit that an engine can have two simultaneous and separate existences, paths, and rates of change of velocity.

Mr. Russell says finally that the "nett acceleration" is the difference between the load factor and gravity; this is so in horizontal flight, but the statement is untrue all the way round a loop; and in defining load factor he evidently refers to his (imaginary) gross acceleration. Surely it would be much simpler to define load factor as *applied load divided by machine weight*.

W. E. GRAY.

Edgware, Middlesex.
December 23, 1929.

AIR SURVEY

[2257] There is an error in the article appearing in the issue of FLIGHT dated December 27, under the heading of "A New Air Survey Contract in Northern Rhodesia."

This occurs on page 1344 when referring to the survey of the Irrawaddy Delta. It is stated that Major Cochrane Patrick joined the undersigned and carried out the flying and technical supervision of the survey.

While it is a fact that Major Cochrane Patrick in this instance carried out the whole of the survey flying very efficiently, he had nothing whatever to do with the technical supervision, and I think it will be only fair to those who were responsible for the technical supervision, that the error should be corrected.

AIR SURVEY CO., LTD.,
R. C. KEMP,
Managing Director.

London, S.W.1.
December 30, 1929.

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Latest News of Sir Alan Cobham

SIR ALAN COBHAM, who is on a flight to the Cape, is now (January 1) at Ndola (Northern Rhodesia). According to reports received in Bulawayo, he is unable to take off owing to the condition of the ground which has been rendered swampy by several days' rain.

Another Soviet Air Line

A REGULAR air service between Moscow, Baku, and Teheran was opened on January 1.

THE ROYAL AIR FORCE

NEW YEAR PROMOTIONS

THE following promotions are made with effect from January 1, 1930 :—

General Duties Branch

Air Commodores to Air Vice-Marshals.—Edgar Rainey Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C. ; Arthur Murray Longmore, C.B., D.S.O. ; Cyril Louis Norton Newall, C.B., C.M.G., C.B.E., A.M.

Group Captains to Air-Commodores.—Patrick Henry Lyon Playfair, M.C. ; Arthur Wellesley Bibsworth, C.M.G., D.S.O., A.F.C. ; William Foster MacNeece Foster, C.B.E., D.S.O., D.F.C.

Wing Commanders to Group Captains.—Reynell Henry Verney, O.B.E. ; Lawrence Arthur Pattinson, D.S.O., M.C., D.F.C. ; Robert John Ferguson Barton, O.B.E. ; William Lawrie Welsh, D.S.C., A.F.C. ; Hugh Lambert Reilly, D.S.O. ; John Tremayne Babington, D.S.O. ; Eric Mackay Murray, D.S.O., M.C. ; Victor Osborne Rees, O.B.E.

Squadron Leaders to Wing Commanders.—Reginald Blaney Bulteel Colmore, O.B.E. ; Reginald Stuart Maxwell, M.C., D.F.C., A.F.C. ; Percy Clark Sherren, M.C. ; Hugh Vivian Champion de Crespigny, M.C., D.F.C. ; Charles Henry Elliott-Smith, A.F.C. ; John Cannan Russell, D.S.O. ; Anthony Rex Arnold, D.S.C., D.F.C. ; Charles Joseph Mackay, M.C., D.F.C. ; Alexander Gray, M.C. ; Ronald Graham, D.S.O., D.S.C., D.F.C. ; Robert Dickinson Oxland, O.B.E. ; Horace Percy Lale, D.S.O., D.F.C.

Flying Officers to Flight Lieutenants.—Herbert Stafford, George Gerald Morsby, Thomas Henry Moon, Christopher Herbert Schofield (Lieut. Welch Regt.).

Lieutenant-Commander, R.N., Flying Officer, R.A.F., to Flight-Lieutenant.—Henry Lockhart St. John Fancourt.

Lieutenants, R.N., Flying Officers, R.A.F., to Flight-Lieutenants.—Cyril Bristowe Tidd ; Robert Godmond Poole.

Stores Branch

Wing Commander to Group Captain.—William Robert Bruce, O.B.E.

Squadron Leaders to Wing Commanders.—Walter John Brice Curtis, O.B.E. ; William Edgar Aylwin, O.B.E. ; Henry Lumsden Crichton, M.B.E.

Flight-Lieutenants to Squadron Leaders.—Arthur Thomas Cooper ; Arthur Benjamin Wiggin ; Ernest William Crosbie ; Arthur Myrtle Saywood.

Flying Officers to Flight Lieutenants.—John Gordon Smithson ; Francis Davis Darley Gaussen ; George Godfrey Caledon Pigott ; Cecil. William Rugg ; Charles Norman Scott ; George William Longstaff ; William Bourne.

Accountant Branch

Squadron-Leader to Wing Comamnder.—Percy John Wiseman.

Flight-Lieutanant to Squadron-Leader.—Ralf Harry Cleverly.

Flying Officers to Flight-Lieutenants.—Frederick John Sharer Short ; John James Taylor Rose ; Robert William Lowry Glenn ; William Reginald Donkin ; Desmond Frederick Aubrey Clarke ; Sidney Charles Wyatt ; Arthur Edward West ; Gilbert Goodall.

Medical Branch

Squadron-Leader to Wing Commander.—Thomas James Kelly, M.C., M.D., M.A.

Princess Mary's R.A.F. Nursing Service

Senior Sister (Acting Matron) to Matron.—Miss Emily Mathieson Blair.

Sister to Senior Sister.—Miss Winifred Maud Coulthurst.

Sister to Acting Senior Sister.—Miss Margaret Watt Walker.

London Gazette, December 24, 1929.

General Duties Branch

The follg. Pilot Officers are promoted to rank of Flying Officer :—E. S. Greenwood (Oct. 8) ; H. Kerr (Oct. 13) ; J. Cox (Nov. 25). Group Capt. P. L. W. Herbert, C.M.G., C.B.E., is placed on retired list at his own request and is granted permission to retain the hon. rank of Air Commodore (Dec. 3).

Accountant Branch

Flight Lt. R. M. Grundy is placed on retired list at his own request (Dec. 19).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

M. J. Creswell is granted a commn. in Class A.A. (ii) as a Pilot Officer on probation (Dec. 11). The follg. Flying Officers relinquish their commns. on completion of service :—A. E. T. Bruce (Dec. 2) ; J. J. B. Rutter (Dec. 23). Pilot Officer J. H. Thompson resigns his commn. in the Special Reserve (Dec. 10).

Medical Branch

Flight Lt. G. Kinneir relinquishes his commn. on completion of servic (Dec. 19).

AUXILIARY AIR FORCE

General Duties Branch

No. 603 CITY OF EDINBURGH (BOMBER) SQUADRON.—Flying Officer T. Usher resigns his commn. (Dec. 9).

R.A.F. COLLEGE AND SCHOOLS

Cranwell College

THE following is an extract from the report of the Commandant of the Royal Air Force College at the Passing Out Inspection of Flight Cadets, December, 1929 :—

At the present time there are 104 Flight Cadets under training. With the exception of one case of disobedience of flying orders discipline has been very good. The under-officers and non-commissioned officers of the IVth Term have carried out their duties with conspicuous zeal and ability. The general conduct of the Cadets has been most satisfactory.

The total time flown by Cadets during this last term has amounted to 2,052 hours. The term now passing out consists of 19 Cadets, who average 106 flying hours per head, of which 37 hours is the average time flown solo on Service type. This is the first occasion on which the term passing out has averaged over 100 hours' flying per head, while this same term has produced the largest percentage of Fighter pilots yet recorded, *i.e.*, a total of 12 out of 19 Cadets. This indicates an improvement in the standard as well as in the amount of flying done.

In English Literature and General History the term passsing out leaves a record of uniform industry and progress over two years. This has been in part due to the example of its senior Cadets, who have shown that it is possible to achieve success simultaneously in flying, work and games.

The work of the IIIrd Term has improved, but is still below the standard of a senior term. Term II has worked well, and in Term I there are some promising students.

The Debating Society has held three debates, at which the standard of speaking was high. 300 books have been added to the Library, to which Cadets refer more than ever for their essays and terminal theses.

The Cadets in all terms are working satisfactorily and well in Aeronautical Science, but emphasis must again be laid on the importance of making full use of the time available for private study.

Cadets have shown keenness and interest in Aeronautical Engineering. In particular, the work of the two senior terms has been good and has had a beneficial effect on the general standard achieved by the remainder. A visit was paid by the IVth Term to the Armstrong Siddeley Aero Works at Coventry, and this, thanks to the arrangements made by the firm, proved both interesting and instructive.

The IVth Term have completed the syllabus in armament and carried out all practices very satisfactorily. Their work on the whole has been good. The remaining terms have made satisfactory progress in the syllabus and their work has shown keenness and attention to detail. For the first time the R.A.F. Rifle Association has given permission for Flight Cadets to shoot in the " Nobel Challenge Cup " Competition, and two teams will be entered.

The new syllabus for signals laid down by Air Ministry will be in force next session in respect of all Cadets of the junior year. Instruction has been

continued with the present senior term on the old syllabus, modified somewhat to stress the more practical side of the work. This term has completed the syllabus and achieved a very satisfactory standard of work. The work of all terms has been good.

Work in Air Pilotage has been satisfactory and keen interest has been shown in particular by the term passing out. The standard of cross-country flying has improved.

The syllabus in parachutes has been carried out, and Cadets of the IVth Term have received instruction in parachute inspection, packing, method of jumping, and control when descending. No practice jumps have been made. A personal issue of parachutes has now been made to each Cadet, and it is hoped that Cadets will now acquire the habit of taking proper care of their parachutes.

During the period under review the total number of Cadets admitted to hospital was 33, as compared with 36 admitted during the period January to July, 1929.

The foundations of the new College building are now nearly completed.

Cadets have taken a keener interest in Physical Training than in the previous term. The standard has been good though it could still be improved. The average improvement in physical development for the term passing out is :—Height, 0·9 ins. ; weight, 9·6 lb. ; chest measurement (normal), 1·8 ins. ; chest measurement (expanded), 1·6 ins.

One Boxing contest only has taken place during the term, against a team of officers of the Royal Air Force. The contest was lost by 4 fights to 5. The standard has been very satisfactory.

The high standard in Rugby football of the previous season has been maintained, and the match against the R.M.A. was drawn (6 points each), while that against the R.M.C. was lost by a narrow margin (12 points to 16). Twelve matches were played, of which 8 were won, 3 lost, and 1 was drawn.

The standard of Skill-at-arms has been very satisfactory in all weapons. The following results were obtained :—v. Birmingham Fencing Club, lost, 10 points to 21 ; v. London Rifle Brigade, lost, 15 points to 21.

Seventeen Association football matches have been played, of which 7 have been won, 9 lost, and one drawn. The standard of play has been very satisfactory, but the team has rather lacked finish. The match against the R.M.A., Woolwich, was lost by 2 goals to 3 after a close game.

In spite of dry weather, and hard ground, at the beginning of the season, the College Beagles have provided consistently good sport. A larger number of Cadets have attended the meets than was the case last season.

The Sword of Honour, presented to the best all-round Flight Cadet in the senior term, has been awarded to F./Cdt. Under-Officer George Reginald Alexander Elsmie.

The R.M. Groves Memorial Prize, for the best all-round Pilot in the senior term, has been awarded to F./Cdt. Under-Officer George Reginald Alexander Elsmie.

The Abdy Gerrard Fellowes Memorial Prize, for the Flight Cadet of the senior term obtaining the highest total marks in Mathematics and Science, has been won by F./Cdt. Under-Officer George Reginald Alexander Elsmie.

The prize awarded to the Flight Cadet in the senior term obtaining the highest marks in Humanistic Subjects has been won by F./Cdt. Sergeant Richard Lindsay Wallace.

The Prize awarded to the Flight Cadet in the senior term obtaining the highest marks in Aeronautical Engineering has been won by F./Cdt. Corporal Alfred Earle.

School of Technical Training (Apprentices), Royal Air Force, Halton

Extracts from the Report of the Air Officer Commanding, Royal Air Force, Halton, upon the occasion of the passing-out of the 15th (January, 1927) entry of aircraft apprentices.

The January, 1927, entry is the 15th to complete the Service course of training as aircraft apprentices. This is also the first occasion on which an advanced course for corporals will not follow the passing-out of an entry.

The entry has reached a relatively high standard in every department, and the results as a whole are decidedly an improvement on some previous ones.

The standard of drill and discipline is as good as can be expected, and has shown gradual improvement, particularly in certain respects : in steadiness on parade, dress and appearance, cleanliness of barrack rooms, and upkeep and lay-out of kit. The general behaviour of the entry has been excellent on the whole.

Within the limits prescribed by time and weather, physical training has been satisfactorily carried out.

The 15th entry has been well up to the average in games, and particularly in Rugby, athletics, boxing and swimming. Games within the wing have been re-organised in order to introduce more competition and interest for the lesser lights. This has proved an undoubted success. Although great success may not have been achieved in every department of sport, at least great keenness and a pleasant sporting spirit has been shown. More grounds have been made available, to the general advantage.

The health of this entry has been average. Some loss of time was experienced in the autumn of 1928, when several rooms were isolated on account of a small outbreak of scalet fever. In order to reduce the time lost from instruction owing to sickness, a form of light duty has been introduced for the benefit of aircraft apprentices suffering from minor injuries only, enabling them to attend all training which does not involve physical effort.

The training of the Fitters Aero Engine in this entry has not followed as closely to the sequence of the syllabus as could be wished. The causes for this can all be traced to difficulties of either accommodation or establishment, and usually to both.

Instruction in engine running faults has been given on small Austin engines, and this is a very satisfactory method. The course given on installation and running aeroplane engines in airframes has been continued on the same lines as before.

This is the last entry of Carpenter Riggers to be trained at Halton. Efforts have been made to follow the same system of teaching as that adopted for fitters, but, excepting rigging, the problem is entirely different as the work consists chiefly of practical exercises and aircraft construction. The entry has constructed three Gamecocks, fitted two new longerons to an Avro for the Training Flight, and repaired a crashed Avro for use in the Wing Rigging Bay. Skill at bench work varies more in individual cases than that of fitters, but at its best reaches a very high level.

As regards coppersmiths and sheet metal workers, the general standard has been well maintained. Two apprentices were selected from the trade this year to demonstrate sheet metal working at the Model Engineer Exhibition held in London.

The entry began in a mediocre fashion, but soon improved and has continued to progress steadily during the course. The passing-out examination results give abundant evidence of steady, persevering work throughout the course on the part of a large number of boys. It has been encouraging to find that the lower classes have obtained comparatively good results. They have shown the greatest keenness to take advantage of the opportunities offered, and have developed an all-round ability.

It is a gratifying indication to find that as a result of their training here a large number of boys have sought advice in connection with further pursuit of their studies of aeronautical science after they leave Halton.

In general studies, the emphasis laid upon Service work and outlook has given the course considerable point and definition. The apprentices of this entry should have a grasp of the general conditions in the countries which they are likely to serve, and some understanding of the problems which face the Empire, and of the part their service may be called upon to undertake in the solution of those problems.

This entry has suffered to a considerable extent from the fact that classes have had their education officers changed so often. This has been due to the abnormal number of education officers posted to and from Halton, and the resultant inter-wing postings.

It is felt that this report would be incomplete without reference to the work of the training staff—service and civilian—who have given of their best in preparing the aircraft apprentices of this entry for their Service career.

It is by no means an easy task to instruct, nor is the work of an instructor necessarily finished at the end of the routine working day. Nevertheless, opportunities are found by the staff to assist aircraft apprentices in finding some form of congenial occupation and showing them the right use of such leisure time as Service life affords.

These are the objects of the Debating and Dramatic Society, Model Aeroplane Society, etc., and the instruction in boxing and other sports in which many of the staff also interest themselves for the benefit of the aircraft apprentice.

The passing-out of this entry will bring into Service life a large number of keen and competent mechanics, who, if carefully fostered for a time amidst the somewhat different surroundings of productive work, will prove their worth.

It is of interest to note as an example of their keenness, that with the exception of less than twenty, the whole of the entry volunteered for airman pilots.

Prize Winners.—Grand aggregate :—561094 Dale, G. T. (F.A.E.). Highest in Educational Subjects : 561094 Dale, G. T. Best Fitter Aero Engine : 561345 Pattison, C. 2nd Best Fitter Aero Engine : 561249 Holmes, W. A. P. Best Carpenter Rigger : 561386 Weeks, G. W. Best Coppersmith and Silversmith Worker : 561324 Oxford, A. Cadetships : 561094 Dale, G. T. ; 561206 Porter, E. F. ; 561326 Needham, S. W. Wakefield Scholarship : 561094 Dale, G. T.

Cranwell School : Electrical and Wireless School, Royal Air Force

Extract from Commandant's Report at the Passing-out Inspection of the January, 1927, Entry of Aircraft Apprentices, December, 1929.

This is the eleventh Passing-out Inspection of Aircraft Apprentices who have been trained at the Electrical and Wireless School. Altogether there are 244 Aircraft Apprentices under training at the Electrical and Wireless School (exclusive of this Passing Out Entry) :—110 of these are being trained as wireless operator mechanics, and 134 as electricians. The discipline of this entry has been very good. They have set a high standard, which, it is hoped, the junior entries will emulate. All have satisfactorily completed their drill, and have fired Table " A " of the Musketry Course.

In technical subjects the aircraft apprentices of this entry have made steady progress, and have attained a good average standard. This is the more creditable when one bears in mind the considerable dislocation due to the move to Cranwell from Flowerdown, and the real discomfort of the latter station during the cold weather last spring. As classes, they have co-operated well with their various instructors, and have been easy to handle.

In W/T operating the standard is well above the average, and the ability to handle traffic speedily and accurately was most marked during their examinations in the W/T Out-Stations.

The progress and general standard in the workshops is satisfactory, and the advent of the new workshop equipment, in the form of power-driven lathes, afforded an incentive to produce better work. The electrician apprentice, have taken a particular interest in their practical workshops, and as far as skill of hand is concerned, they represent the best class in the entry. In air operating and aircraft wiring, the work of the entry compares very favourably with that of preceding entries.

Amongst other benefits, the move to Cranwell has enabled facilities for evening study and practice to be put at the disposal of all pupils to a far greater extent than was possible formerly. It is satisfactory to report that this entry has made full use of these facilities, and has undoubtedly reaped great benefit from the informal manner in which they have been able to bring their difficulties to their instructors.

In educational subjects the entry has attained a fair average standard. The entry now passing out did not attain quite as good a standard as the entry of January, 1926 ; the difference is small, as shown by the examination results, and is probably due to the severe weather and widespread minor sickness general amongst the apprentices in the term immediately before their examination. Individual members of the entry have done exceptionally well. Four of the apprentices have scored more than 75 per cent. in their three years' work, and justly claim the distinction of " Pass with Credit." Forty-four of the apprentices have done well enough to be exempt from compulsory educational test until their promotion to sergeant becomes a matter of moment. How serious this matter is to the individual will depend upon the use he has made of the educational facilities provided on all stations.

The health of the aircraft apprentices has, on the whole, been very good.

This entry has reached a high standard of physical training. At Cranwell, with the increased facilities of a drill hall, a gymnasium and a swimming bath, the junior entries will benefit by a more comprehensive physical training course than has been possible at Flowerdown.

In Rugby football, fourteen apprentices of the passing-out entry play for the Squadron 1st XV. A good fixture list has been secured, and although some matches have had to be cancelled owing to the hard ground, up to the time of writing this report, four matches have been played and won.

The Squadron has entered its Association 1st XI in the local leagues, and up to date they have won four out of seven matches in the Ruskington League, and three out of five matches in the R.A.F. Athletic Championships.

There is a most satisfactory keenness in boxing and shooting. During a recent boxing match of 20 fights, arranged between the apprentices and the Winchester Rifle Depot Recruits, the Rifle Depot won the match with 33 points against the apprentices 27 points, but in view of the fact that the apprentices were fighting against men, this result is considered to be most satisfactory. All the fights were exceptionally clean and open, and punishment was given and taken extremely well. With this passing-out entry we lose Flight-Leading Apprentice Wright, who is the R.A.F. Aircraft Apprentices' Welter-Weight Champion.

Of the present entry, 10 have passed out as Leading Aircraftmen, 35 have passed out as Aircraftmen First Class, and 16 have passed out as Aircraftmen Second Class. There have been no failures.

Cadetships have been offered to 561306 A./A. Monks, R. ; 571317 A./A. Pyke, A. ; 561178, A./A. Harries, E W.

The winner of the " Hyde-Thomson " Memorial Prize is 561306 A./A. Monks, R.

561306 A./A. Monks, R., wins the prize offered by the Air Ministry for the aircraft apprentice who obtains the highest aggregate marks in all sections.

561317 A /A. Pyke, A., wins the prize offered by the Air Ministry for the Aircraft Apprentice who obtains the highest marks in technical subjects.

561336 A./A. Patterson, J. H., wins the prize offered by the Air Ministry for the Aircraft Apprentice who obtains the highest marks in educational subjects.

IN PARLIAMENT

Long-Distance Flight Disaster

SIR SAMUEL HOARE, on December 19, asked the Under-Secretary of State for Air whether he could give the House any information with reference to the accident to the long-distance flight machine and the death of the two pilots ?

Mr. Montague : I am not yet in a position to add materially to the information which has already been made public about this most regrettable disaster. The reports so far received from His Majesty's Consul-General in Tunis merely state that the machine crashed in the hills some 30 miles south of Tunis, the weather at the time being both cloudy and stormy, and that Sqdn.-Ldr. Jones-Williams and Flight Lieut. Jenkins were both killed. A military guard has been placed over the machine and the Consul-General left at dawn this morning for the scene of the accident with a view to obtaining the fullest possible information and bringing the bodies of the dead officers to the Military Hospital in Tunis.

The Air Ministry have already despatched a technical officer to Tunis, in order that the fullest expert inquiry practicable may be made on the spot. Pending receipt of his report no cause can be assigned to the accident. I should like to add that the responsible French authorities have given the greatest possible assistance. I am sure the whole House will join with me in deploring the loss of the lives of two gallant officers of such outstanding promise and in conveying to their relatives an expression of our most profound sympathy.

England-India Air Mail

MR. MONTAGUE, in reply to Capt. Balfour said between the opening of the England-India air mail service on March 31, 1929, and November 30, 1929, the number of completed flights to Karachi was 35 and from Karachi 31. Up to October 31, the mail arrived after the schedule date on three occasions at Karachi, and on three occasions at Croydon, and in addition it was lost on the occasion of the two accidents, at Jask outwards and near Spezia homewards. The service has throughout been organised on a basis of the carriage of mails by train for the stage between Basle and Genoa. Since November 1, however, largely owing to climatic conditions on the alternative mid-European route, temporarily operated from that date, the air mail has been carried on all occasions for longer stages by train, and on some also by sea, and it has not in consequence been possibleto adhere to a completely regular schedule.

Air Forces : Great Britain and United States

MR. MONTAGUE on December 23, in reply to Sir R. Gower, said the first-line strength of the Royal Air Force at the present time is 772 aircraft. As regards America, the last edition of the Armaments Year Book of the League of Nations shows the first-line strength of the United States Army and Naval Air Forces as 857 aircraft in 1928, a number which is believed to have since risen to more than 900.

Air-Post Stamps

ON December 24 the Postmaster-General (Mr. Lees-Smith), in reply to Mr. Everard, said : I have considered the adoption of a distinctive air-mail stamp, and in view of the inherent objections I have decided against its introduction.

Mr. Everard : Can the Parliamentary Secretary say how it is that the Dominions are able to adopt an air mail stamp, and why it is not possible in this country ?

Mr. Lees-Smith : The hon. Member is mistaken ; not all the Dominions have adopted the air mail stamp, and the reports which we have investigated do not encourage us to repeat the experiment.

Royal Air Force Aircraft

IN reply to Captain H. Balfour, Mr. Montague said a certain number of D.H. 9a and Bristol Fighter aircraft are still in use, but both types have been so continuously developed and improved that they now differ greatly from the war-time aircraft of the same names. It is hoped to substitute new types of aircraft for all D.H.9a's by the end of 1930, and for all Bristol Fighters by the end of 1932.

Women's Royal Air Force and Miss Douglas-Pennant

MR. W. J. BROWN, on December 24, raised the question of the dismissal of Miss Douglas-Pennant from the Air Ministry in 1918, and asked for an explanation of the circumstances.

Sir William Jowitt (Attorney-General), during a lengthy reply, said they had to throw their minds back to August, 1918, when the war was still in a not uncritical phase. The number of men available for enlistment in the R.A.F. was strictly limited, and it was necessary to supplement them as far as possible by women.

Unfortunately the organisation of the " W.R.A.F.'s " was wholly unsatisfactory. Lord Weir was then Secretary for Air, and there was not a shadow of doubt that he changed his mind. There was no doubt that on August 7 an answer was given that Miss Douglas-Pennant was giving every satisfaction, but between that date and August 2 Sir Auckland Geddes had caused to be written a letter to Lord Weir, which called attention to the thoroughly bad organisation of the Women's Royal Air Force. That letter called attention to the fact that immediate steps must be taken to remedy the organisation, and Lord Weir had to consider the best step to be taken, and what person was the best to take those steps.

On August 25 he made up his mind to replace Miss Douglas-Pennant as head of the W.R.A.F. by somebody else, and when he came to that decision he had seen nobody and had seen no document except from Sir Auckland Geddes. He subsequently, rightly or wrongly, came to the conclusion that Miss Douglas-Pennant was not the best person fitted for that particular job at that particular time, and, acting on that conclusion, he did that which any honest man would have done—took steps to displace her. He (Sir William Jowitt) agreed that the manner of her discharge was one for the greatest regret, and for that Lord Weir apologised.

" It was made perfectly plain to Miss Douglas-Pennant," he proceeded, " that there is not, there never has been, the smallest ground for suggesting that Miss Douglas-Pennant was guilty of any kind of moral turpitude or moral fault or moral obliquity, or that she was at any time doing any other than the best she could in the interests of the W.R.A.F. Let it be equally plainly understood that there is no charge made whatever against Miss Douglas-Pennant's general efficiency. Her long record of honourable public service shows she was a most efficient person in organisation in other respects."

Charges had been made of the most serious and grave nature. The committee of investigation came unanimously to the conclusion that there was no substance in the charges ; that the charges ought never to have been made, and they expressed their regret that they had been made.

He had come to the conclusion that it would be grossly unjust to other people who were closely concerned, and who had had charges made against them, if the matter were to be reopened. These scandals would be raked over again although these people had vindicated themselves.

There was not an honest person in the world who should have any hesitation in being proud to know a woman such as Miss Douglas-Pennant. She should rest content with his statement that there had never been the slightest charge against her honour.

PUBLICATIONS RECEIVED

Illustrated Calendar for 1930 : *" Outward Bound " Blackburn " Nile."* The Blackburn Aeroplane and Motor Co., Ltd., Amberley House, Norfolk Street, London, W.C.2.

The Nickel Bulletin. Nov., 1929. *Vol.* 2. *No.* 5. The Mond Nickel Co., Ltd., Imperial Chemical House, Millbank, S.W.1.

Reminders for Company Secretaries. By Herbert W. Jordan. Jordan and Sons, Ltd., 116-118, Chancery Lane, W.C.2. Price 2*s.* 6*d.* By post 2*s.* 9*d.*

Aeronautical Research Committee Reports and Memoranda : No. 1233 (*Ae.* 388).—The Graphical and Analytical Determination of Stresses in Single Span and Continuous Beams under End Compression and Lateral Load with Aviations in Shear, Distributed Load and Moment of Inertia. By H. B. Howard. June, 1928. Price 2*s.* H.M. Stationery Office, Kingsway, London, W.C.2.

The NAFT A.P.O.C. Magazine, Nov. 1929. *Vol. V, No.* 6. —The Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C.2.

The Countryman. Christmas Number. No. 4. *Vol.* III. J. W. Robertson Scott, Idbury, Kingham, Oxford. Price 2*s.* 6*d.* Quarterly.

The Dobbie-McInnes " Farnboro " Electric Indicator. Dobbie McInnes and Clyde, Ltd., 57, Bothwell Street, Glasgow.

Illustrated Calendar, 1930. The Bristol Aeroplane Co., Ltd., Filton, Bristol.

Aircraft Handbook. By F. H. Colvin and H. F. Colvin. McGraw-Hill Publishing Co. Ltd., 6 and 8, Bouverie Street, E.C.4. Price 25*s.*

All the World's Aircraft, 1929. Edited by C. G. Grey. Founded in 1911 by Fred T. Jane. London : Sampson Low, Marston and Co., Ltd. Price £2 2*s.* net.

*Instruction Manual for Users of the " Eagle " Aircraft Camera, R.A.F. Service Type F.*8. Williamson Manufacturing Co., Ltd., Litchfield Gardens, Willesden Green, London, N.W.10. Price 2*s.* 6*d.* net.

The British Schneider Trophy Team, 1929. Reproduction of a Painting by A. Coombe Richards. Issued jointly by the Supermarine Aviation Works, Ltd., Vickers (Aviation), Ltd., and Rolls-Royce, Ltd.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations : Cyl. = cylinder ; i.c. = internal combustion ; m. = motors. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1928

Published January 2, 1930

25,892. P. SCHILOVSKY. System of signalling in fog. (322,472.)
28,054. ARMSTRONG SIDDELEY MOTORS, LTD., F. R. SMITH and S. M. VIALE. Superchargers for i.c. engines. (322,570.)
37,594. G. H. DOWTY. Shock-absorbing and springing mechanisms applicable to aircraft. (322,657.)

APPLIED FOR IN 1929

Published January 2, 1930

2,463. J. KSOLL. Aeroplane with supporting surface subdivided by gaps. (322,687.)
6,293. A. ROHRBACH. Seaplane floats and hulls. (306,903.)

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